



*Ninety-Eighth  
Annual Commencement  
June 12, 1992*

CALIFORNIA INSTITUTE OF TECHNOLOGY

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*Ninety-Eighth*  
*Annual*  
*Commencement*

FRIDAY MORNING AT TEN O'CLOCK  
JUNE TWELFTH, NINETEEN NINETY-TWO

# The Commencement Ceremony

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 supermagisterial 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*

# *Academic Procession*

*Chief Marshal*, David B. Wales, Ph.D.

## *Assistant Marshals*

Arden L. Albee, Ph.D.	Christopher E. Brennen, D.Phil.
Judith R. Goodstein, Ph.D.	D. Roderick Kiewiet, Ph.D.
Ward Whaling, Ph.D.	David S. Wood, Ph.D.

## *Faculty Officers*

John H. Richards, Ph.D.	John O. Ledyard, Ph.D.
Ward Whaling, 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 CHAIRMEN OF THE DIVISIONS

THE DEANS

THE PROVOST

THE TRUSTEES

THE COMMENCEMENT CHAPLAIN

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  
William Bing, M.M., Conductor
- PRESIDING . . . . . Ruben F. Mettler, Ph.D.  
Chairman of the Board of Trustees  
California Institute of Technology
- INVOCATION . . . . . Monsignor Gary P. Bauler  
St. Philip the Apostle
- COMMENCEMENT ADDRESS. . . . . "Today's Science and Tomorrow's Decisions"  
David P. Gardner, Ph.D.  
President, University of California
- CHORAL SELECTION . . . . . The Caltech Glee Clubs  
Donald G. Caldwell, D.M.A., Conductor
- "Hallelujah" from *Messiah*  
George Frederick Handel  
(The audience will please rise during the singing of the "Hallelujah" chorus.)
- CONFERRING OF DEGREES. . . . . Thomas E. Everhart, Ph.D.  
President  
California Institute of Technology
- PRESENTATION OF CANDIDATES FOR DEGREES
- For the Degree of Bachelor of Science. . . Christopher E. Brennen, D.Phil.  
Dean of Students

For the Degree of Master of Science . . . . . Gary A. Lorden, Ph.D.  
*Vice President for Student Affairs*

For the Degree of Engineer . . . . . Arden L. Albee, Ph.D.  
*Dean of Graduate Studies*

For the Degree of Doctor of Philosophy . . . . . Dr. Albee

Biology . . . . . Ray D. Owen, Ph.D., Sc. D.  
*Professor of Biology, Emeritus*

Chemistry and Chemical Engineering . . . . . Fred C. Anson, Ph.D.  
*Division Chairman*

Engineering and Applied Science . . . . . John H. Seinfeld, Ph.D.  
*Division Chairman*

Geological and Planetary Sciences . . . . . David J. Stevenson, Ph.D.  
*Division Chairman*

Physics, Mathematics and Astronomy . . . . . Gerry Neugebauer, Ph.D.  
*Division Chairman*

ANNOUNCEMENT OF AWARDS AND  
CONCLUDING REMARKS . . . . . President Everhart

ALMA MATER . . . . . The Caltech Glee Clubs,  
The Caltech Wind Ensemble, Brass, and Organ  
*(The audience may join in; lyrics are found on page 35.)*

BENEDICTION . . . . . Monsignor Bauler

RECESSIONAL . . . . . The Caltech Convocations Brass and  
Percussion Ensemble

ORGAN POSTLUDE . . . . . Dr. Deutsch

# Candidates for Degrees

## BACHELOR OF SCIENCE

- Andrew Masami Abo\* *Silverdale, Washington* Electrical Engineering  
Pamela Ann Abshire\* *Salem, Virginia* Physics  
Ian Agol\* *Concord, California* Mathematics  
Todd Michael Allendorf *Clinton, Iowa* Engineering and Applied Science  
Kevin Allen Archie *Bessemer, Michigan* Engineering and Applied Science  
Swagato Banerjee *Calcutta, India* Physics  
Richard Doosung Bang *Germantown, Tennessee* Engineering and Applied Science  
and Mathematics  
Jeannie Ellen Barrett\* *Coral Gables, Florida* Chemistry  
Ole David Bergset *Boise, Idaho* Electrical Engineering  
Noam Bernstein\* *Glendale, Wisconsin* Applied Physics and Engineering and  
Applied Science  
John David Bomberger *Littleton, Colorado* Chemical Engineering  
Lanny Eugene Boswell *Allen, Nebraska* Electrical Engineering  
David Michael Bourgeois *New Orleans, Louisiana* Engineering and Applied Science  
Jack Kyle Boyce\* *Grants Pass, Oregon* Physics  
William Nielsen Brandt\* *Janesville, Wisconsin* Physics  
Deepinder K. Brar *Tucson, Arizona* Biology and Literature  
Dean William Brettle\* *Woodbridge, Virginia* Engineering and Applied Science  
Glenn Christopher Brown\* *Opelika, Alabama* Electrical Engineering  
Stephanie Elizabeth Buck *Safety Harbor, Florida* Engineering and Applied Science  
Lee James Burrows\* *St. Augustine, Florida* Applied Physics  
Eric Michael Candell *Gonzales, Louisiana* Physics  
Matt Jeffrey Carlson\* *St. Cloud, Minnesota* Chemistry  
James A. Caron *New Bedford, Massachusetts* Engineering and Applied Science  
Joseph Peter Caroselli *Springfield, Pennsylvania* Electrical Engineering  
and Economics  
Steven Louis Carson *Chesterfield, Missouri* Chemical Engineering  
Jerry Kaywin Carter *Austin, Texas* Physics  
Brian Gilbert Chafin *Blacksburg, Virginia* Engineering and Applied Science  
Mark Albert Chamness\* *Kerman, California* Physics  
Barbara Jean Chang *San Marino, California* Engineering and Applied Science  
A. Raghava Chari\* *Calcutta, India* Mathematics

*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*

- Eric Hong Y. Chen\* *Shanghai, China* Electrical Engineering  
Lei Chen *Pasadena, California* Biology  
Ti-Ming Chiang\* *Seremban, Malaysia* Physics  
Gladys Chow\* *Hong Kong, Hong Kong* Engineering and Applied Science  
Chek Piow Chuan\* *Seremban, Malaysia* Electrical Engineering  
Matthew Ames Class\* *Saratoga, California* Physics  
Brian Carl Clendenin\* *Cochranville, Pennsylvania* Engineering and Applied Science  
Matthew Collett *Lewes, East Sussex, England* Mathematics  
Andrew Lawrence Crews *Mill Valley, California* Electrical Engineering  
Walter Wilson Crim III *Los Angeles, California* Engineering and Applied Science  
David Marcel Cutrer\* *Atlanta, Georgia* Applied Physics and Electrical Engineering  
Cristian J. Daugbjerg *Escondido, California* Engineering and Applied Science  
Mikel Wayne Davis\* *Cedar Hill, Texas* Biology  
Alexander Logan Densmore *San Luis Obispo, California* Geology  
Scott Michael Dolim *Rancho Palos Verdes, California* Engineering and Applied Science  
David Aaron Matzner Dominguez *Albuquerque, New Mexico* Applied Physics  
Joseph Alexander Duncan\* *Captain Cook, Hawaii* Biology  
Gary Michael Eastvedt *Temple City, California* Social Science  
Stephen Anthony Edwards\* *Minneapolis, Minnesota* Electrical Engineering  
Teresa Lucille Engelhard\* *Lake Oswego, Oregon* Engineering and Applied Science  
Doruk Engin\* *North Hollywood, California* Physics  
Matthew Robert Fetterman\* *Pacific Palisades, California* Physics  
Matthew Kurt Fields *Salt Lake City, Utah* Applied Physics  
Frank Joseph Filipanits, Jr. *Englewood, Florida* Electrical Engineering  
Daniel John Flees\* *Muskego, Wisconsin* Physics  
Garritt William Foote *Wayne, Nebraska* Electrical Engineering and Economics  
Tracy C. Fu\* *Albuquerque, New Mexico* Applied Physics  
Andrew Kang Sang Fung\* *Portland, Oregon* Engineering and Applied Science  
Christan Adam Garrison\* *Los Angeles, California* Engineering and Applied Science  
Mohammad Reza Gharib\* *Teheran, Iran* Engineering and Applied Science  
Delwyn Leewitt Gilmore\* *Chattanooga, Tennessee* Engineering and Applied Science  
Jeremy Nathan Gollub *Sacramento, California* Physics  
Varoujan Gorjian *Glendale, California* Astronomy  
Michael Gideon Greenblatt\* *San Francisco, California* Mathematics  
Roman Carlos Gutierrez *Madrid, Spain* Applied Physics  
Gregory David Hale *Bakersfield, California* Applied Physics  
Steven Michael Harkness *Bismarck, North Dakota* Electrical Engineering  
Shameem Hashmi\* *Karachi, Pakistan* Engineering and Applied Science  
Nathaniel Douglas Hieter *Clinton, New York* Engineering and Applied Science

BACHELOR OF SCIENCE — *Continued*

- Albert K. Ho\* *Needham, Massachusetts* Biology  
Christopher Mark Ho\* *Orange, California* Engineering and Applied Science  
Mary Kathryn Hodsden *Mesa, Arizona* Engineering and Applied Science  
Monica Jocelyn Holboke *Las Vegas, Nevada* Engineering and Applied Science  
Nancy Ai-Hua Hong\* *Los Altos Hills, California* Biology  
Hanna Shih-Han Hsu\* *Cerritos, California* Electrical Engineering  
James Calvin Hu\* *La Habra Heights, California* Engineering and Applied Science  
Nancy Kuang Hua *Park Ridge, Illinois* Engineering and Applied Science  
Zhirong Huang\* *Beijing, P.R. China* Physics  
Steven Chi-Shin Hwang\* *Seoul, Korea* Engineering and Applied Science  
Anna Margarete Jaeckel\* *LaGrange Park, Illinois* Engineering and Applied Science  
Joseph Brinton Jensen\* *Logan, Utah* Astronomy  
Karin Melinda Johnson\* *Plymouth, Minnesota* Biology  
Jeffrey Alan Jones\* *Albuquerque, New Mexico* Engineering and Applied Science  
Ari David Kaplan *Lawrenceville, New Jersey* Engineering and Applied Science  
Pamela Mai Katz Rosten *Los Angeles, California* Chemistry  
Hiroyuki Jonathan Kawamura *Issaquah, Washington* Astronomy  
Zafaryab Ali Khan *Peshawar, Pakistan* Electrical Engineering  
Bryan Hyung Joong Kim *Syosset, New York* Engineering and Applied Science  
David Keesu Kim\* *San Francisco, California* Physics  
Jung-Ah Kim\* *Seoul, Korea* Geochemistry  
Daniel Rex Kollmorgen *Riverton, Wyoming* Engineering and Applied Science  
Joseph J. Kubicky *Media, Pennsylvania* Electrical Engineering  
Hampden Dwight Kuhns *Louisville, Kentucky* Engineering and Applied Science  
Tod Edward Kurt *Las Vegas, Nevada* Electrical Engineering  
Mark Thomas Lakata\* *Fallbrook, California* Physics  
Mark William Shannon Land\* *Scottsdale, Arizona* Engineering and Applied Science  
Keith Allen Langer *Pomona, New York* Engineering and Applied Science  
Garland Anne Lee *Lincoln, Nebraska* Engineering and Applied Science  
Robert Bumju Lee\* *Midvale, Utah* Applied Physics  
Lieven Pascal Leroy *Nova Scotia, Canada* Engineering and Applied Science  
Edward Roger Lew\* *Los Angeles, California* Electrical Engineering  
Jonathan Nanda Liljebblad *Duncanville, Texas* Engineering and Applied Science  
Sheldon Kevin Lim *Whittier, California* Applied Physics  
Thomas Liman *Surabaya, Indonesia* Physics  
Varavut Limpasuvan\* *Los Angeles, California* Engineering and Applied Science  
Alexander Talun Lin *Columbia, South Carolina* Engineering and Applied Science  
David James Lin *St. Louis, Missouri* Engineering and Applied Science  
Dong Lin\* *Beijing, China* Engineering and Applied Science

BACHELOR OF SCIENCE — *Continued*

Aaron Jacob Lipman\* *Seattle, Washington* Engineering and Applied Science  
Robert Liu *Hacienda Heights, California* Electrical Engineering and Economics  
Fiona Ai-Ming Lo *Sherman Oaks, California* Planetary Science  
Gaylon R. Lovelace, Jr. *Dry Ridge, Kentucky* Engineering and Applied Science  
Yvonne Yuetwah Lung\* *Arcadia, California* Engineering and Applied Science  
Timothy Bradford Maddux\* *Thousand Oaks, California* Engineering and Applied Science

Rahul Saumik Mahajan *Austin, Texas* Mathematics  
Harry Michael Mahon\* *Jacksonville, Florida* Chemical Engineering  
Marc Hanna Malek\* *Beirut, Lebanon* Engineering and Applied Science  
Christopher Anthony Martin\* *Richardson, Texas* Applied Physics  
Jerri Harumi Martin *San Pedro, California* Biology  
David Paul Max *Brookline, Massachusetts* Engineering and Applied Science  
Michael George Maxwell\* *Piedmont, California* Mathematics  
Mckeithen Larkin McCormick *Bartlett, Ohio* Applied Physics  
Jason Wayne McElroy\* *Canyon Country, California* Physics  
Michael Yablin Meckler *Sarasota, Florida* Engineering and Applied Science  
Andrea Francine Mejia *North Olmsted, Ohio* Geochemistry  
Gregory James Melden *Pasadena, California* Chemical Engineering  
David J. Merrill *Eugene, Oregon* Electrical Engineering  
Jason Perry Modisette\* *Nassau Bay, Texas* Physics  
Alfredo Martin Morales\* *Los Angeles, California* Chemistry  
Tamaki Murakami\* *Glendale, California* Engineering and Applied Science  
Emmeline Christine Naranjo *Daly City, California* Engineering and Applied Science  
Celia Sue Ng *Cypress, California* Engineering and Applied Science  
Hiok Tiaq Ng\* *Georgetown, Penang, Malaysia* Electrical Engineering  
Tuan Dinh Nguyen\* *Saigon, Vietnam* Electrical Engineering  
Jay Phillip Obernolte *Fresno, California* Engineering and Applied Science  
Matthew Carter Paduano *Jupiter, Florida* Physics  
Ki Hong Pak *Jacksonville, Florida* Engineering and Applied Science  
Shan-Ng Pak\* *Hong Kong, Hong Kong* Engineering and Applied Science  
Jonathan Nader Pakianathan\* *Ipoh, Malaysia* Physics and Mathematics  
Jon Damien Pelletier\* *Braintree, Massachusetts* Physics  
A. Albert Marc Petterson *Elgin, Illinois* Engineering and Applied Science  
Tan Khac Pham *Honolulu, Hawaii* Physics and Electrical Engineering  
Ari Pine *Plantation, Florida* Engineering and Applied Science  
Phillip McKinney Pippenger, Jr. *Baton Rouge, Louisiana* Electrical Engineering  
Christopher John Pollett *East Bay, Nova Scotia* Mathematics  
Allen C. Price\* *Memphis, Tennessee* Physics

BACHELOR OF SCIENCE — *Continued*

- Betty Kong-Ling Pun\* *Hong Kong, Hong Kong* Chemical Engineering  
Christopher Scott Raymond\* *Woonsocket, Rhode Island* Applied Mathematics  
Eugene Reyzer\* *Moscow, USSR* Physics and Applied Mathematics  
Nathan Clarke Rockwell\* *Hemet, California* Biology  
Peter Anthony Rogan *Ft. Wayne, Indiana* Engineering and Applied Science  
James Wesley Rogers, Jr. *Marion, Ohio* Engineering and Applied Science  
Julianne Marie Rogers\* *Portland, Oregon* Biology  
William Donald Rogers *La Crescenta, California* Electrical Engineering  
Christopher D. Rosin\* *Glendale, Wisconsin* Engineering and Applied Science  
David Judson Ross *Carlsbad, California* Physics  
Carl Duane Roth\* *Springfield, Virginia* Electrical Engineering  
Mary Anderson Rowe\* *Phoenix, Arizona* Physics  
Paul Raymond San Clemente\* *Peabody, Massachusetts* Physics  
Karl Matthew Schneider *Rend, Oregon* Engineering and Applied Science  
Tal Schwartz *North Miami Beach, Florida* Engineering and Applied Science  
and Economics  
Sean P. Shannon *Westminster, Colorado* Electrical Engineering  
Kirill V. Shcheglov\* *Boston, Massachusetts* Applied Physics  
Grant Roberts Sitton *El Cajon, California* Engineering and Applied Science  
Frederick Field Sloneker *Wapakoneta, Ohio* Economics  
Sherwood Lan Smith *Ville Platte, Louisiana* Chemical Engineering  
Robert G. Southworth *Baltimore, Ireland* Mathematics  
Kurt Frederick Stephens *Barrington, Rhode Island* Applied Mathematics  
Andrew Joseph Stevens\* *Provo, Utah* Chemistry  
Randall William Stevenson *Indianapolis, Indiana* Engineering and Applied Science  
Eric Alan Stout\* *Muncie, Indiana* Electrical Engineering  
Hsiao-Te Su\* *Taipei, Taiwan, ROC* Mathematics  
Allan Sumiyama *Kobe, Japan* Electrical Engineering  
Jason Anthony Surace\* *Utica, New York* Astronomy  
Shio-Hsien Tai *Aiea, Hawaii* Electrical Engineering  
Jun Teng\* *Beijing, China* Mathematics  
Emerson Cua Tongco *Quezon City, Philippines* Engineering and Applied Science  
Shun T. Tsai\* *Mont Clare, Pennsylvania* Engineering and Applied Science  
and Economics  
Michelle Tseng *Rancho Palos Verdes, California* Engineering and Applied Science  
Christopher George Tully\* *Alexandria, Virginia* Physics  
Bonnie Jean Wallace *Waco, Texas* Literature  
Deron Andrew Walters\* *Upper Arlington, Ohio* Physics  
Elizabeth L. Wang\* *Monterey Park, California* Engineering and Applied Science

BACHELOR OF SCIENCE — *Continued*

Takashi Watabe\* *Tochigi, Japan* Physics

Daniel Webster Weaver *Hellam, Pennsylvania* Applied Physics

Emily Paishan Wen *Arcadia, California* Chemical Engineering

Peter Michael Wenzel *Sparta, Wisconsin* Engineering and Applied Science

James Henry Werner\* *Albuquerque, New Mexico* Applied Physics

Duke Whang\* *Glendale, California* Mathematics and Economics

Todd P. Whitesel *San Jose, California* Engineering and Applied Science

Christopher Louis Ziomkowski *Santee, California* Independent Study Program

## MASTER OF SCIENCE

- John Robert Arrington (*Physics*) B.S., University of Wisconsin-Madison 1990.
- Amir Attaran (*Biology*) B.A., University of California, Berkeley 1988.
- Hovel Yeghia Babikian (*Civil Engineering*) B.S., California State Polytechnic University, Pomona 1991.
- Ronen Barzel (*Computer Science*) Sc.B., Brown University 1983; Sc.M., 1984.
- Arash R. Bashirullah (*Biology*) B.Sc., The University of Winnipeg 1989.
- Nikolaos Bekiaris (*Chemical Engineering*) Diploma, National Technical University of Athens 1989.
- Rodolfo Giacomo Beraha (*Electrical Engineering*) B.S.E., B.A., University of Pennsylvania 1991.
- Mei Bin (*Physics*) B.S., Tsinghua University 1987.
- Richard Alan Boyd (*Physics*) B.S., Emory University 1990.
- Stefanie Ann Brachfeld (*Geology*) B.S., University of Rochester 1990.
- Ruth Amy Brain (*Physics*) B.S., Iowa State University 1990.
- Paul Joseph Brewer (*Social Science*) B.S., California Institute of Technology 1989.
- Clark Dowdy Brooks (*Computer Science*) B.S., California Institute of Technology 1983.
- Deborah Lynne Brown (*Chemistry*) B.S., Haverford College 1990.
- Michael Christopher Burl (*Electrical Engineering*) B.S., California Institute of Technology 1987.
- Dale Lee Capewell (*Applied Physics*) B.S., Cornell University 1986.
- Depto Chakrabarty (*Physics*) S.B., Massachusetts Institute of Technology 1988.
- Ricky Yuan Chen (*Electrical Engineering*) B.S., University of California, Irvine 1990.
- John Chu-Tin Chiu (*Physics*) B.S. (*Physics*), B.S. (*Optics*), University of Rochester 1990.
- Giuseppe Codispoti (*Electrical Engineering*) Laurea Di Dottore, Università degli Studi della Calabria 1990.
- Sean Thomas Cole (*Chemical Engineering*) B.S., University of California, Santa Barbara 1987.
- Kevin Richard Curtis (*Electrical Engineering*) A.S., Antelope Valley College 1987; B.S., California Institute of Technology 1990.
- Raffaello D'Andrea (*Electrical Engineering*) B.A.Sc., University of Toronto 1991.
- Donald Dabdub (*Chemical Engineering*) B.S., Lehigh University 1990.
- Bakul Vijay Damle (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Bombay 1990.
- Er Deng (*Electrical Engineering*) B.S., Tsinghua University 1986; M.S., 1989.
- Sanjaya Rajiv Dharmasena (*Electrical Engineering*) B.S., The University of Virginia 1991.
- Olga Divovitch (*Environmental Engineering Science*) B.S., Moscow Mendeleev Institute of Chemical Technology 1989.

MASTER OF SCIENCE — *Continued*

- Igor Djokovic (*Electrical Engineering*) B.S., University of Belgrade 1990.
- Zhaoqin Dong (*Applied Mechanics*) B.Sc., Jiangxi Institute of Metallurgy 1982;  
M.Sc., Institute of Aeronautical Materials 1985.
- Jean-Jacques Drolet (*Electrical Engineering*) B.Sc.A., Université Laval 1990.
- Elizabeth Dianne Duxbury (*Planetary Science*) S.B., Massachusetts Institute of  
Technology 1988.
- April Lee Ericksen (*Electrical Engineering*) B.S., Harvey Mudd College 1990.
- Frederic Farina (*Electrical Engineering*) Diplôme d'Ingénieur, Institut National des  
Sciences Appliquées de Lyon 1991.
- Todd Robert Fernandez (*Aeronautics*) B.A., Williams College 1991.
- Brenda Lynn Fiala (*Chemistry*) B.A., University of Colorado at Boulder 1990.
- Jean-Michel Robert Fourquié (*Electrical Engineering*) Diplôme d'Ingénieur, Ecole  
Supérieure d'Ingénieurs en Electrotechnique et Electronique 1992.
- Timothy Scott Frank (*Applied Physics*) B.S., Baylor University 1990.
- Daniel Harrison Friedman (*Applied Mechanics*) A.B., Cornell University 1990.
- Aaron David Gillespie (*Physics*) B.A., The University of Virginia 1990.
- Sonja Glavaški (*Electrical Engineering*) Diploma, University of Belgrade 1988; M.S.,  
1991.
- Luis Filipe Domingues Goncalves (*Electrical Engineering*) B.A.Sc., University of  
Waterloo 1991.
- Kenneth A. Gordon (*Aeronautics*) B.A.Sc., University of Toronto 1991.
- Mark Andrew Gurwell (*Planetary Science*) B.S., University of Washington 1990.
- Jerry Lee Haney (*Biology*) B.A., University of Colorado at Boulder 1989.
- Susan Elaine Haney (*Chemistry*) B.A., Amherst College 1989.
- Lara Nicole Hartmann (*Aeronautics*) B.S., The University of Texas at Austin 1991.
- Narayan Hegde (*Electrical Engineering*) B.Tech., Indian Institute of Technology,  
Bombay 1991.
- Alan Bryant Heirich (*Computation and Neural Systems*) A.B., The University of  
Michigan 1987; M.S., University of California, San Diego 1989.
- Tyler Reed Holcomb (*Chemical Engineering*) B.S., The University of Texas at Austin  
1987.
- Irwin Kenneth Horowitz (*Astronomy*) S.B. (*Physics*), S.B. (*Earth, Atmospheric and  
Planetary Sciences*), Massachusetts Institute of Technology 1986.
- Inez Hua (*Environmental Engineering Science*) B.A., University of California,  
Berkeley 1990.
- Ching-Tung Huang (*Civil Engineering*) B.S., National Chiao Tung University 1985;  
M.E., Carnegie-Mellon University 1991.
- Fredrick William Irion (*Chemical Engineering*) B.A.Sc., University of Ottawa 1989.
- Lyatt Jaegle (*Environmental Engineering Science*) Diplôme d'Ingénieur, Institut  
Industriel du Nord 1992.
- Fukang Jiang (*Electrical Engineering*) B.S., Hangzhou University 1984; M.S., 1987.

MASTER OF SCIENCE — *Continued*

- Rajesh Kedia (*Mechanical Engineering*) B.Tech., Indian Institute of Technology, Kharagpur 1991.
- Scott David Kelly (*Mechanical Engineering*) B.S., Cornell University 1991.
- John Bartholemew Kenney (*Electrical Engineering*) A.B., Stonehill College 1987; B.S., University of Notre Dame 1988.
- Jung-Hoon Kim (*Aeronautics*) B.S., Korea University 1989.
- John Edward Kitching (*Applied Physics*) B.Sc., McGill University 1990.
- Robert Andrew Knop, Jr. (*Physics*) B.S., Harvey Mudd College 1990.
- Rajesh Kumar (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Madras 1991.
- David Hales Laidlaw (*Computer Science*) Sc.B., Brown University 1984; Sc.M., 1986.
- James Edwin Larkin (*Physics*) B.S., California State University, Hayward 1990.
- Sharon Lynn Laubach (*Electrical Engineering*) B.A., M.A., The University of Virginia 1990.
- Jiafu Luo (*Applied Physics*) B.S., University of Science and Technology of China 1987.
- Timothy Wyckoff Lynch (*Astronomy*) A.B., Cornell University 1990.
- Torrey Teatsorth Lyons (*Physics*) B.A., University of California, Berkeley 1989.
- John Emmett Malady (*Environmental Engineering Science*) B.S., University of Utah 1991.
- Adam George Malik (*Physics*) B.S., Rensselaer Polytechnic Institute 1990.
- Andrea Marion (*Environmental Engineering Science*) Laurea, Università degli Studi di Padova 1990.
- Christopher Jay McArthur (*Environmental Engineering Science*) B.S., Oregon State University 1991.
- Gary M. McGuire (*Mathematics*) B.Sc., University College Dublin 1989; M.Sc., 1990.
- Stuart McMuldloch (*Planetary Science*) B.Sc., University College London 1988.
- Raanan Ariel Miller (*Electrical Engineering*) B.S., Boston University 1991.
- Jeffrey Charles Moore (*Chemical Engineering*) B.S., North Carolina State University 1989.
- Alina Moussessian (*Electrical Engineering*) B.S., Iran University of Science and Technology 1988.
- Hari A. Nair (*Planetary Science*) B.S., Gannon University 1990.
- Cheryl Napier (*Biology*) B.S., The Pennsylvania State University 1990.
- Venkata Varadha Rajan Natarajan (*Mechanical Engineering*) B.Tech., Indian Institute of Technology, Delhi 1991.
- Takanori Ogata (*Civil Engineering*) B.E., Tohoku University 1981; M.E., 1983.
- Aaron Ian Packman (*Environmental Engineering Science*) B.S., Washington University 1991.
- Fernando G. Paganini (*Electrical Engineering*) Ingeniero Electricista, Licenciado en Matemáticas, Universidad de la República-Uruguay 1990.

MASTER OF SCIENCE — *Continued*

- Anthony David Perry (*Aeronautics*) B.E., The University of Melbourne 1991.
- Michael J. Pertel (*Computer Science*) B.A., B.S., The University of Chicago 1988.
- Robert Lee Pfefferkorn (*Environmental Engineering Science*) B.S., University of Maryland 1990.
- Yên Lam Pham (*Electrical Engineering*) B.S., Harvey Mudd College 1991.
- See-May Phoong (*Electrical Engineering*) B.S., National Taiwan University 1991.
- Aurelius Oldrich Prochazka (*Aeronautics*) B.S., Rensselaer Polytechnic Institute 1991.
- Joseph Fallaw Puett III (*Mechanical Engineering*) B.S., United States Military Academy 1982.
- Dan Raphaeli (*Electrical Engineering*) B.Sc., Ben Gurion University of the Negev 1987.
- Douglas Bradley Raven (*Chemical Engineering*) B.S., The University of Texas at Austin 1986.
- Garrett Erin Reisman (*Mechanical Engineering*) B.S.E., B.S., University of Pennsylvania 1991.
- David John Revolinski (*Aeronautics*) A.A., Orange Coast College 1989; B.S., University of California, Davis 1991.
- Rudolph Jenkins Rico (*Chemistry*) B.A., State University of New York at Buffalo 1990.
- Stephen Kyle Roof (*Mechanical Engineering*) B.S., Oregon State University 1986.
- Bernard Rousset (*Aeronautics*) Diplôme d'Ingénieur, Ecole Centrale Paris 1991.
- François Rozon (*Aeronautics*) B.Eng., McGill University 1991.
- Katri Karin Saari (*Social Science*) B.A., Northwestern University 1990.
- David Austin Sauer (*Geology*) B.S. (*Geology*), B.S. (*Biology*), University of Alaska, Fairbanks 1989.
- Puneet Sawhney (*Electrical Engineering*) B.E., Delhi College of Engineering, University of Delhi 1991.
- John Griffin Schroder (*Applied Mathematics*) B.S., Northwestern University 1990.
- Sima Setayeshgar (*Physics*) S.B. (*Physics*), S.B. (*Mathematics*), Massachusetts Institute of Technology 1990.
- Elizabeth Eve Shaffer (*Geochemistry*) B.S., Indiana University 1990.
- David Wayne Shimer (*Social Science*) B.A., The University of Texas at Austin 1990.
- Ghazala Yasmeen Siddiqui (*Environmental Engineering Science*) B.E., N.E.D. University of Engineering and Technology 1991.
- Geoffrey Halsted Sive (*Social Science*) B.A., University of California, San Diego 1984; M.A., 1987.
- Richard Arthur Solomon (*Applied Physics*) B.S., Cornell University 1990.
- Mariel Spalter (*Electrical Engineering*) B.S., Northwestern University 1989.
- Mullahalli V. Srinivas (*Applied Mechanics*) B.E., Bangalore University 1985; M.Sc., Indian Institute of Science 1989.

MASTER OF SCIENCE — *Continued*

- Sudipto Sur (*Mechanical Engineering*) B.Tech., Indian Institute of Technology, Bombay 1991.
- Kenji Togami (*Aeronautics*) B.E., The University of Tokyo 1987.
- Kimberly A. Tryka (*Planetary Science*) A.B., Cornell University 1989.
- Philip Shihmiao Tsai (*Chemical Engineering*) B.S., University of Illinois at Urbana-Champaign 1990.
- Robert Vincent Uy (*Aeronautics*) B.S.E., The University of Michigan 1991.
- Michael William Vanik (*Aeronautics*) Sc.B., Brown University 1991.
- Steven Ashton Walton (*Mechanical Engineering*) B.S., Cornell University 1991.
- Carl Richard Wassgren Jr. (*Mechanical Engineering*) B.S., University of Illinois at Urbana-Champaign 1990.
- Takashi Watabe (*Physics*) B.S., California Institute of Technology 1992.
- William Nicholas Weir (*Astronomy*) A.B., Harvard College 1987.
- John Alan Wendel (*Materials Science*) B.S., California Institute of Technology 1991.
- David William Whinery (*Aeronautics*) Sc.B., Brown University 1991.
- Selmer Siu Man Wong (*Physics*) B.S., University of California, Los Angeles 1990.
- Yuanjian Xu (*Applied Physics*) B.S., Chengdu Institute of Radio Engineering 1985; M.S., Shanghai Jiao Tong University 1987.
- Yoshiro Yamada (*Electrical Engineering*) B.E., The University of Tokyo 1983; M.E., 1985.
- Maximillian Youchun Yang (*Chemistry*) A.B., Harvard College 1990.
- Wenbo Yang (*Geophysics*) B.E., Beijing Institute of Technology 1983; M.E., 1986.
- Markus Yap (*Electrical Engineering*) A.B., Occidental College 1990.
- Haiyun Zhang (*Physics*) Peking University.
- Dongyan Zhou (*Electrical Engineering*) B.S., Zhejiang University 1989.
- Jianhui Zhou (*Applied Physics*) B.S., Beijing University of Posts and Telecommunications 1984; M.S., 1987.

ENGINEER

- John Murray Bowen (*Aeronautics*) B.S., University of California, Berkeley 1989; M.S., California Institute of Technology 1991.
- Steven Craig Gortsema (*Aeronautics*) B.S., Hope College 1989; M.S., California Institute of Technology 1990.
- Sunil Kumar Malhotra (*Mechanical Engineering*) B.S.E., The University of Michigan 1989; M.S., California Institute of Technology 1990.
- Liping Yan (*Civil Engineering*) B. Eng., Southwestern Jiaotong University 1983; M.Eng., 1986; M.S., California Institute of Technology 1990.

## DOCTOR OF PHILOSOPHY

### DIVISION OF BIOLOGY

- Raffi Van Aroian (*Biology*) S.B., Massachusetts Institute of Technology 1983.  
Thesis: The *let-23* Gene of the Nematode *C. elegans*: Genetics and Molecular Biology of a Member of the EGF Receptor Tyrosine Kinase Family.
- William Keith Funkhouser, Jr., M.D. (*Immunology*) B.S., Vanderbilt University 1975; M.D., 1979.  
Thesis: Demyelinating Autoimmunity: Murine T Cell Epitopes of MBP and Primate T Cell Receptor V Beta Variation.
- Tina Kramer Garyantes (*Biophysics*) B.S.E., University of Pennsylvania 1983.  
Thesis: The Effect of Electrical Stimulation on Neuronal Outgrowth and the Development of a New Method for Chronic Long-Term Stimulation and Recording from Groups of Neurons in Culture.
- Jon Faiz Kayyem (*Molecular Biology*) B.S., M.S., Yale University 1985.  
Thesis: Bravo, a Novel Immunoglobulin Superfamily Member in the Developing Avian Nervous System, Is Identified Using a New Method.
- David John Cameron MacKay (*Computation and Neural Systems*) B.A., Cambridge University 1988.  
Thesis: Bayesian Methods for Adaptive Models.
- Misha Mahowald (*Computation and Neural Systems*) B.S., California Institute of Technology 1985.  
Thesis: VLSI Analogs of Neuronal Visual Processing: A Synthesis of Form and Function.
- Arie M. Michelsohn (*Cellular and Molecular Neurobiology*) A.B., Columbia University 1982; M.S., California Institute of Technology 1986.  
Thesis: Sequential Steps in the Determination of Chromaffin Cell Fate by Glucocorticoids.
- Joseph Edward Minor, Jr. (*Biology*) B.S., Texas A&M University 1983.  
Thesis: Evolution of the Sea Urchin Sperm Protein Bindin.
- Andrew John Moore (*Computation and Neural Systems*) B.S., University of Illinois at Urbana-Champaign 1983.  
Thesis: Spatial Filtering in Tone Reproduction and Vision.
- Murray Owen Robinson (*Biology*) B.A., University of California, San Diego 1984.  
Thesis: Gene Regulation During Spermatogenesis: Transcriptional and Translational Control of Phosphoglycerate Kinase 2 in Transgenic Mice.
- Scott A. Strobel (*Biology*) B.A., Brigham Young University 1987.  
Thesis: Site Specific Cleavage of Genomic DNA Mediated by Triple Helix Formation.
- Sean Vahram Tavtghian (*Molecular Biology and Biochemistry*) B.A., Pomona College 1984.  
Thesis: the regulatory capacity of the protooncogene c-myc.

*When more than one field of study is listed, in the Division of Biology it indicates a dual major; in other divisions the first is the major and the second and others are minors.*

DOCTOR OF PHILOSOPHY — *Continued*

- Bernadus Theodorus Maria Vernooij (*Molecular Biology and Biochemistry*) B.S.,  
University of Utrecht 1979; Doctorandus, 1983.  
Thesis: The Mouse T Cell Receptor Gamma Genes.

DIVISION OF CHEMISTRY AND CHEMICAL ENGINEERING

- Shenda Mary Baker (*Chemistry*) B.A., Grinnell College 1985.  
Thesis: Scanning Tunneling Microscopy and Spectroscopy of Silicon and Carbon Surfaces.
- John Edward Bauer (*Chemical Engineering*) B.S., The University of Michigan 1985.  
Thesis: Hydrodynamic Interactions in Polymer Dynamics.
- Chak Keung Chan (*Chemical Engineering*) B.S., The University of Texas at Austin 1986.  
Thesis: Studies of Levitated Single Droplets.
- Moon Kyu Choi (*Chemical Engineering*) B.S., Seoul National University 1984; M.S.,  
1986.  
Thesis: Particle Shape Effects on Gas-Solid Reactions.
- Christine S. Chow (*Chemistry*) A.B., Bowdoin College 1987; M.A., Columbia  
University 1988.  
Thesis: Transition Metal Complexes as Probes for Higher-Order Structure in RNA.
- Peijun Cong (*Chemistry*) B.S., Jilin University 1983; M.A., State University of New  
York at Buffalo 1986.  
Thesis: Femtosecond Photodissociation Dynamics of Alkali Halides.
- Christopher Di Simone (*Chemistry*) B.A., The Johns Hopkins University 1986.  
Thesis: The Membrane Fusion Activities of Native and Reconstituted Mumps and  
Sendai Viruses.
- Robert Edward Donnelly, Jr. (*Chemistry*) B.A., Cornell University 1984.  
Thesis: Modeling and Visualizing Surfaces.
- Maria Rebecca Giorgi (*Chemistry*) B.S., University of California, Los Angeles 1985.  
Thesis: Experimental and Theoretical Studies of the Hydrogen Exchange Reaction.
- Christopher B. Gorman (*Chemistry*) B.A., Drew University 1987.  
Thesis: Highly Conjugated, Substituted Polyacetylenes via the Ring-Opening  
Metathesis Polymerization of Monosubstituted Cyclooctatetraenes.
- Yuejin Guo (*Chemistry*) B.S., Jilin University 1982; M.S., 1985.  
Thesis: I. Molecular Simulations of Buckyball Fullerenes. II. Quantum Chemistry  
Studies on High- $T_c$  Superconductors.
- Lynda K. Johnson (*Chemistry*) B.A., Wartburg College 1986.  
Thesis: Methods for the Synthesis of Tungsten Alkylidenes: Ring-Opening of  
Cyclopropenes and Alkylidene Transfer from Phosphoranes.
- Yong Pyo Kim (*Chemical Engineering*) B.S., Seoul National University 1981; M.S.,  
Korea Advanced Institute of Science and Technology 1983.  
Thesis: Simulation of Multicomponent Aerosol Dynamics.

DOCTOR OF PHILOSOPHY — *Continued*

- Amit Kumar (*Chemistry*) A.B., Occidental College 1986; M.S., Stanford University 1988.  
Thesis: Charge Transfer Studies of Semiconductor Interfaces.
- Narayanan Damodaran Kurur (*Chemistry*) B.Sc., University of Madras 1982; M.Sc., Indian Institute of Technology, Madras 1984.  
Thesis: I. Quantum-Mechanical Chemical Exchange. II. NMR of Semiconductors.
- Zhuyin Li (*Chemistry*) B.S., Xiamen University 1983; M.S., The University of Texas at Austin 1987.  
Thesis: Proton Pumping in Cytochrome *c* Oxidase: The Possible Role of Cu<sub>A</sub> in Redox Linkage.
- Peter Jon Licari (*Chemical Engineering and Biology*) B.S., Tufts University 1987; M.S. (*Biochemical Engineering*), 1988; M.S. (*Chemical Engineering*), California Institute of Technology 1990.  
Thesis: An Engineering Analysis of the Insect Cell-Baculovirus Expression System.
- Kevin James Luebke (*Chemistry*) B.S., Purdue University 1986.  
Thesis: Sequence Specific Nonenzymatic Ligation of Single- and Double-Stranded DNA by Triple Helix Formation.
- Sharon Ruth Lunt (*Chemistry*) B.S., Harvey Mudd College 1983; M.S., Stanford University 1988.  
Thesis: Electrochemical, Photoluminescence, and Surface Studies of the Passivation of Surface Recombination Processes on Chemically Treated Gallium Arsenide Surfaces.
- Dominic Vincent McGrath (*Chemistry*) B.S., Yale University 1986.  
Thesis: The Organometallic Chemistry of Aqueous Ruthenium(II) with Functionalized Olefins: Complex Formation, Isomerization, and Metathesis Chain Transfer.
- Girish Jagdish Pendse (*Chemical Engineering and Biology*) B.Tech., Indian Institute of Technology, Bombay 1987; M.S., California Institute of Technology 1989.  
Thesis: Influence of Genetic Factors on the Productivity of Recombinant *Chinese Hamster Ovary* (CHO) Cells.
- Thomas Joseph Povsic (*Chemistry*) B.S., Bowling Green State University 1985; M.S., 1986.  
Thesis: Oligonucleotide-Directed Sequence Specific Recognition and Alkylation of Double Helical DNA by Triple Helix Formation.
- Mary Theresa Rodgers (*Chemistry*) B.S. (*Chemistry*), B.S. (*Mathematics*), Illinois State University 1985.  
Thesis: A Theoretical and Experimental Investigation of the H<sub>3</sub> System.
- Karen Lynn Shannon (*Chemistry*) B.S., Houghton College 1987.  
Thesis: Conformational and Mechanistic Studies of Asparagine-Linked Glycosylation.
- Frank Guojun Shi (*Chemical Engineering and Materials Science*) B.S., Nanjing Institute of Meteorology 1983; M.S., University of Guelph 1987.  
Thesis: Kinetics of Nucleation and Crystallization.

DOCTOR OF PHILOSOPHY — *Continued*

- Jumi Anne Shin (*Chemistry*) A.B., Harvard University 1986.  
Thesis: Characterization of the DNA Binding Domains of Helix-Turn-Helix Proteins by Affinity Cleaving.
- Edward Gene Stewart (*Chemistry*) B.S., University of California, Berkeley 1985.  
Thesis: I. The Synthesis and Spectroscopy of a Series of 1,3-Diaryl-1,3-cyclopentadiyls and 1,4-Diarylbicyclo[2.1.0]pentanes. II. Progress Toward the Synthesis of Non-Kekulé Naphthalene, a Series of Tetramethyleneethanes, and Bi (cyclobutadienyl).
- Yun Sun (*Chemistry*) B.S., University of Science and Technology of China 1982; M.S., Shanghai Institute of Organic Chemistry 1985.  
Thesis: NMR Studies of Protein-DNA Interactions: Determinations of DNA Structures Recognized by Hin Recombinase and Studies of Their Roles in Protein Binding Interactions.
- Erich Stuart Uffelman (*Chemistry*) B.S., M.S., Bucknell University 1984.  
Thesis: Macrocyclic Tetraamido-N Ligands that Stabilize High Valent Complexes of Chromium, Manganese, Iron, Cobalt, Nickel, and Copper.
- Wen-Ching Wang (*Chemistry*) B.S., National Taiwan University 1983; M.S., University of California, Santa Barbara 1985.  
Thesis: Expression, Structural, and Functional Studies of Fasciclin I.
- Katherine Willdowson (*Chemistry*) B.A., Reed College 1986.  
Thesis: Silicon-Directed Carbon-Carbon Bond Forming Reactions.
- Yi-Shuen Mark Wu (*Chemistry*) B.S., National Taiwan University 1981; M.S., 1985.  
Thesis: Quantum Three-Body Reaction Dynamics Including the Geometric Phase Effect.
- Barbara Ellen Wyslouzil (*Chemical Engineering and Applied Physics*) B.Sc., Queen's University 1980; M.Sc., University of Alberta 1985.  
Thesis: Aspects of Homogeneous Nucleation.
- Hye-Joo Yoon (*Chemistry*) B.S., Seoul National University 1983; M.S., State University of New York at Stony Brook 1986.  
Thesis: The *Saccharomyces cerevisiae* CDC7 Protein Kinase, a Potential Link Between START and the Initiation of DNA Replication.

DIVISION OF ENGINEERING AND APPLIED SCIENCE

- Richard Lewis Martin Ammons (*Applied Mathematics*) B.A. (*Mathematics*), B.A. (*Psychology*), University of Montana 1983.  
Thesis: Mathematical Control Theory for Liquid Chromatography.
- Philip Douglas Askenazy (*Applied Physics*) A.B., Harvard University 1983; M.S., California Institute of Technology 1985.  
Thesis: Deformation-Induced Amorphization of Cu-Ti Intermetallics.

DOCTOR OF PHILOSOPHY — *Continued*

- Ronen Barzel (*Computer Science*) Sc.B., Brown University 1983; Sc.M., 1984.  
Thesis: A Structured Approach to Physically-Based Modeling for Computer Graphics.
- Riccardo Bonazza (*Aeronautics*) Laurea in Ingegneria Meccanica, Università Degli Studi di Ancona 1983; M.S., California Institute of Technology 1985.  
Thesis: X-Ray Measurements of Shock-Induced Mixing at an Air/Xenon Interface.
- John Michael Budzinski (*Aeronautics and Physics*) B.S., Rensselaer Polytechnic Institute 1986; M.S., California Institute of Technology 1987.  
Thesis: Planar Rayleigh Scattering Measurements of Shock Enhanced Mixing.
- Venkata Ramana Murty Challa (*Civil Engineering*) B.Tech., Indian Institute of Technology, Madras 1985; M.Tech., 1986.  
Thesis: Nonlinear Seismic Behaviour of Steel Planar, Moment-Resisting Frames.
- Gregory Scott Chirikjian (*Applied Mechanics*) B.S., M.S., The Johns Hopkins University 1988.  
Thesis: Theory and Applications of Hyper-Redundant Robotic Manipulators.
- Clifford Eugene Frieler (*Aeronautics*) B.S., California Institute of Technology 1982; M.S., 1983.  
Thesis: Mixing and Reaction in the Turbulent 2D Shear Layer.
- William John Andrew Fyfe (*Computer Science*) B.Math., University of Waterloo 1985; M.S., California Institute of Technology 1990.  
Thesis: Invariance Hints and the VC Dimension.
- Ian Andrew Galton (*Electrical Engineering*) Sc.B., Brown University 1984; M.S., California Institute of Technology 1989.  
Thesis: An Analysis of Quantization Noise in  $\Delta\Sigma$  Modulation and Its Application to Parallel  $\Delta\Sigma$  Modulation.
- Stanley B. Grant (*Environmental Engineering Science*) B.S., Stanford University 1985; M.S., California Institute of Technology 1989.  
Thesis: Detection and Partitioning of Bacteriophage in Fluid/Solid Systems: Application to the Ecology and Mobility of Viruses in the Environment.
- Adiel Guinzburg (*Mechanical Engineering*) B.Sc., University of the Witwatersrand 1985; M.S., California Institute of Technology 1986.  
Thesis: Rotordynamic Forces Generated by Discharge-to-Suction Leakage Flows in Centrifugal Pumps.
- Yong Guo (*Electrical Engineering*) B.S., Xi'an Jiaotong University 1982; M.S., California Institute of Technology 1987.  
Thesis: Millimeter-Wave Integrated-Circuit Horn Antenna Imaging Arrays.
- Gary Steven Guthart (*Engineering Science*) B.S., University of California, Berkeley 1987; M.S., California Institute of Technology 1990.  
Thesis: On the Existence and Stability of Standing Solitary Waves in Faraday Resonance.
- Pieter Johannes Hazewindus (*Computer Science*) Ingenieur, Technical University of Eindhoven 1985; M.S., California Institute of Technology 1987.  
Thesis: Testing Delay-Insensitive Circuits.

DOCTOR OF PHILOSOPHY — *Continued*

- Chuanyi Ji (*Electrical Engineering*) B.S., Tsing-Hua University 1983; M.S., University of Pennsylvania 1986.  
Thesis: Generalization Capability of Neural Networks.
- Tasso Joost Kaper (*Applied Mathematics*) B.S. (*Mathematics*), B.S. (*Physics*), The University of Chicago, 1986.  
Thesis: Part I: On the Structure in Separatrix-Swept Regions in Slowly-Modulated Hamiltonian Systems. Part II: On the Quantification of Mixing in Chaotic Stokes' Flows: The Eccentric Journal Bearing.
- Naoki Karasawa (*Applied Physics*) B.S., Keio University 1984.  
Thesis: Simulations of Polymer Crystals: New Methods and Applications.
- Timothy Lawrence Kay (*Computer Science*) Sc.B., Brown University 1983; M.S., California Institute of Technology 1987.  
Thesis: From Geometry to Texture: Experiments Towards Realism in Computer Graphics.
- Anastassia G. Kotronarou (*Environmental Engineering Science*) Diploma, National Technical University of Athens 1985; M.Sc., Imperial College of the University of London 1986.  
Thesis: Ultrasonic Irradiation of Chemical Compounds in Aqueous Solutions.
- Carl Emil Krill III (*Applied Physics*) B.S., University of Notre Dame 1986; M.S., California Institute of Technology 1988.  
Thesis: Instabilities in Nonequilibrium Solid Solutions with Respect to Amorphization and Melting.
- Sanjay Kumar (*Mechanical Engineering*) B.Tech., Indian Institute of Technology, Kharagpur 1985; M.S., University of Delaware 1987.  
Thesis: Some Theoretical and Experimental Studies of Cavitation Noise.
- Ho-Hoon Lee (*Applied Mechanics*) B.E., Yonsei University 1984; M.E., 1986.  
Thesis: Robust Adaptive Control of Manipulators with Application to Joint Flexibility.
- Xiaoming Li (*Environmental Engineering Science*) B.S., Peking University 1982; M.S. (*Biochemistry*), 1985; M.S. (*Environmental Engineering Science*), University of Cincinnati 1987.  
Thesis: Experimental Studies of Char Oxidation and Fume Formation from Pyrite.
- Steven H. Lin (*Electrical Engineering*) S.B., S.M., Massachusetts Institute of Technology 1985.  
Thesis: GaAs Optoelectronic Integrated Circuits for Optical Neural Network Applications.
- Lingyun Lu (*Aeronautics and Materials Science*) B.S., Beijing Institute of Aeronautics and Astronautics 1983; M.S., California Institute of Technology 1986.  
Thesis: On the Development and Application of a Modified Boundary Element Method for the Analysis of Three-Dimensional Elastostatic Problems in Thick Plates.
- Shiu-Hong Lui (*Applied Mathematics*) B.Sc., University of Toronto 1985; M.Sc., 1987.  
Thesis: Part I: Multiple Bifurcations. Part II: Parallel Homotopy Method for the Real Nonsymmetric Eigenvalue Problem.

DOCTOR OF PHILOSOPHY — *Continued*

- Mark Thomas Lusk (*Applied Mechanics*) B.S., United States Naval Academy 1982; M.S., Colorado State University 1988.  
Thesis: Martensitic Phase Transitions with Surface Effects.
- Mark Joseph Lysek (*Applied Physics*) B.S., University of Illinois at Urbana-Champaign 1982.  
Thesis: A Thermodynamic Study of Layering and Capillary Condensation of Methane Adsorbed on Graphite Foam.
- Russell Edgar Mau (*Civil Engineering*) B.S., Iowa State University 1985; M.S., California Institute of Technology 1987.  
Thesis: Particle Transport in Flow through Porous Media: Advection, Longitudinal Dispersion, and Filtration.
- Aharon Melman (*Applied Mathematics*) B.S. (*Physics*), Catholic University of Louvain 1982; B.S. (*Mathematics*), 1983; M.S., Technion - Israel Institute of Technology 1986.  
Thesis: Complexity Analysis for the Newton Modified Barrier Function Method.
- Timothy Malcolm Minahen (*Aeronautics*) B.S., University of California, Berkeley 1977; M.S., 1979.  
Thesis: Structural Instabilities Involving Time Dependent Materials: Theory and Experiment.
- Albert Norman Moser (*Applied Mechanics*) B.S., Brown University 1986; M.S., California Institute of Technology 1987.  
Thesis: An Experimental Investigation of Modeling and Optimal Control of Modified Space Structures.
- Balasubramanya T. Nadiga (*Aeronautics and Physics*) B.Tech, Indian Institute of Technology, Madras 1986; M.S., California Institute of Technology 1987.  
Thesis: A Study of Multi-Speed Discrete-Velocity Gases.
- Kevin N. Otto (*Mechanical Engineering*) B.S., University of Minnesota 1988.  
Thesis: A Formal Representational Theory for Engineering Design.
- Douglas Harvey Pearson (*Applied Physics*) B.S., University of Wisconsin, Eau Claire 1985; M.S., California Institute of Technology 1988.  
Thesis: Measurements of White Lines in Transition Metals and Alloys Using Electron Energy Loss Spectrometry.
- Rajaram Ramesh (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Madras 1987; M.S., California Institute of Technology 1988.  
Thesis: Efficient Multichannel Methods for High-Rate Data Transmission with Application to ISDN (or) Pouring Water to Get More out of Copper.
- Aaron John Rulison (*Mechanical Engineering*) B.S.E., The University of Michigan 1987; M.S., California Institute of Technology 1988.  
Thesis: Part I: Synthesis of Ceramic Powders by Electrospray Pyrolysis. Part II: An Approach to Interplanetary Particle Sampling.
- Steven Sanders (*Applied Physics*) B.S., Yale University 1986; M.S., California Institute of Technology 1988.  
Thesis: Passive Mode-Locking and Millimeter-Wave Modulation of Quantum Well Lasers.

DOCTOR OF PHILOSOPHY — *Continued*

- Masahiro Sayano (*Electrical Engineering*) B.S., California Institute of Technology 1988; M.S., 1990.  
Thesis: Analyses of Coding and Compression Strategies for Data Storage and Transmission.
- Mark A. Schlautman (*Environmental Engineering Science and Geology*) B.S., The University of Nebraska at Lincoln 1984; M.S., California Institute of Technology 1987.  
Thesis: Mineral Surfaces and Humic Substances: Partitioning of Hydrophobic Organic Pollutants.
- Peter C. Sercel (*Applied Physics*) B.S., University of Arizona 1987; M.S., California Institute of Technology 1988.  
Thesis: Semiconductor Structures in the Quantum Size Regime.
- Craig S. Steele (*Computer Science*) A.B., Harvard College 1974; M.S., California Institute of Technology 1985.  
Thesis: **Affinity**: A Concurrent Programming System for Multicomputers.
- Gregory Daniel Sullivan (*Aeronautics*) B.A.Sc., University of Toronto 1987; M.S., California Institute of Technology 1988.  
Thesis: An Investigation of Mixing and Transport at a Sheared Density Interface.
- Cho-Jen Tsai (*Materials Science*) B.S., National Tsing Hua University 1984; M.S., California Institute of Technology 1989.  
Thesis: Low Energy Ion-Surface Interaction and Epitaxial Growth in the SiGe System.
- Maurice H. P. M. van Putten (*Applied Mathematics*) Ingenieurs, Delft University of Technology 1986.  
Thesis: MHD in Divergence Form: A Computational Method for Astrophysical Flow.
- Robert Mason Weikle II (*Electrical Engineering*) B.S., Rice University 1986; M.S., California Institute of Technology 1987.  
Thesis: Quasi-Optical Planar Grids for Microwave and Millimeter-Wave Power Combining.
- John Brooke Wissler (*Aeronautics*) B.S., University of Maryland 1981; M.S., Air Force Institute of Technology 1984.  
Thesis: Transmission of Thin Light Beams Through Turbulent Mixing Layers.
- Yiu-fai Isaac Wong (*Electrical Engineering*) B.S., California Institute of Technology 1986; M.S. (*Electrical Engineering*), 1987; M.S. (*Computation and Neural Systems*), 1991.  
Thesis: Towards a Simple and Fast Learning Classification System.
- Thomas W. Workman (*Materials Science*) B.S., California Institute of Technology 1986; M.S., 1987.  
Thesis: Analysis of Collision Cascades in Titanium Deuteride by D-D Fusion.
- Alan Akihiro Yamamura (*Electrical Engineering*) S.B. (*Electrical Engineering*), S.B. (*Physics*), S.M., Massachusetts Institute of Technology, 1986.  
Thesis: Neural Network Control and an Optoelectronic Implementation of a Multilayer Feedforward Neural Network.

DOCTOR OF PHILOSOPHY — *Continued*

DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES

- Richard Karl Achterberg (*Planetary Science and Astronomy*) B.A., St. Olaf College 1985.  
Thesis: Numerical Simulation of Baroclinic Jovian Vortices.
- Jacqueline Eaby Dixon (*Geochemistry*) B.S., Stanford University 1981; M.S., 1983.  
Thesis: Water and Carbon Dioxide in Basaltic Magmas.
- Andrea Donnellan (*Geophysics*) B.S., The Ohio State University 1986; M.S., California Institute of Technology 1988.  
Thesis: A Geodetic Study of Crustal Deformation in the Ventura Basin Region, Southern California.
- Thomas S. Duffy (*Geophysics*) B.S., Boston College 1982; M.S., University of Illinois at Chicago Circle 1986; M.S., California Institute of Technology 1988.  
Thesis: Elastic Properties of Metals and Minerals under Shock Compression.
- Mark David Hofstadter (*Planetary Science and Electrical Engineering*) B.S., Stanford University 1984; M.S., California Institute of Technology 1987.  
Thesis: Microwave Observations of Uranus.
- Diane Clemens Knott (*Geology*) B.S., University of California, Los Angeles 1984; M.S., California Institute of Technology 1989.  
Thesis: Geologic and Isotopic Investigations of the Early Cretaceous Sierra Nevada Batholith, Tulare Co., CA, and the Ivrea Zone, NW Italian Alps: Examples of Interaction Between Mantle-Derived Magma and Continental Crust.
- Sara Hanley Fagerson McGill (*Geology*) A.B., Harvard College and Radcliffe College 1985; M.S., California Institute of Technology 1989.  
Thesis: Paleoseismology and Neotectonics of the Central and Eastern Garlock Fault, California.
- Kathryn Pierce Shah (*Planetary Science and Geology*) B.A., Cornell University 1986; M.S., California Institute of Technology 1988.  
Thesis: Interferometric Observations of the J(0,1) CO Line on Venus: Upper Mesospheric Winds and CO Abundance.
- Yuntai (Huin Tai) Jack Sheng (*Geology*) B.S., Central South Institute of Mining and Metallurgy 1976; M.S., 1984.  
Thesis: Origin of Plagioclase-Olivine Inclusions.
- Catherine Louise Smither (*Geophysics*) B.A., The University of Chicago 1982.  
Thesis: Stress Relief Displacements Induced by Drilling and Three-Dimensional Modeling of Planetary Impacts.
- Tomáš Svitek (*Planetary Science*) B.Sc., Czechoslovakia Technical University 1984.  
Thesis: Martian Water Frost: Control of Global Distribution by Small-Scale Processes.

DOCTOR OF PHILOSOPHY — *Continued*

- Michael Bennett Wolf (*Geology*) B.A., Hamilton College 1985; M.S., California Institute of Technology 1988.  
Thesis: Amphibolite-Tonalite Relationships: Part I. Experimental Investigation of the Phase Relationships and Textural Development of Amphibolite Dehydration-Melting; Part II. The Geology, Petrology and Geochronology of a Tonalitic and Mafic Dike Swarm (Southwestern Foothills Terrane, California).
- Charles Bruce Worden (*Geophysics*) B.S., University of California, Riverside 1986; M.S., California Institute of Technology 1988.  
Thesis: Interactive Seismic Imaging on a Multicomputer and Application to the Hosgri Fault.
- Yu-Shen Zhang (*Geophysics*) B.S., Peking University 1982; M.S., University of Science and Technology of China 1984.  
Thesis: Three-Dimensional Modeling of Upper Mantle Structure and Its Significance to Tectonics.
- Lian-She Zhao (*Geophysics*) B.Sc., University of Science and Technology of China 1982; M.S., 1985.  
Thesis: Seismic Waveform Modeling of Regional Phases and Wavefields from an Off-Center Explosion.

DIVISION OF PHYSICS, MATHEMATICS AND ASTRONOMY

- Anne E. Alder (*Physics*) B.A., Westmont College 1985; M.S., California Institute of Technology 1987.  
Thesis: Calculations of Quasielastic Electron Scattering from Nuclei at High Momentum Transfers.
- Guanhua Chen (*Physics*) B.S., Fudan University 1986.  
Thesis: Superconductivities of High- $T_c$  Materials and Alkali Compounds of Buckminsterfullerene.
- Achim Ditzen (*Mathematics*) Diplom-Vorprüfung (*Physics*), Technische Universität Berlin 1986; Diplom-Vorprüfung (*Mathematics*), Freie Universität Berlin 1986; M.S., California Institute of Technology 1988.  
Thesis: Definable Equivalence Relations on Polish Spaces.
- Gregory Peter Dubois (*Physics*) B.A., University of South Florida 1981; M.S., California Institute of Technology 1983.  
Thesis: Upper Limits on Inclusive Branching Fractions to Narrow States in Radiative  $J/\Psi$  Decays.
- Dean Matthew Evasius (*Mathematics*) B.S., University of California, Los Angeles 1987.  
Thesis: Carleman Inequalities with Convex Weights.

DOCTOR OF PHILOSOPHY — *Continued*

- Peyton Stinson Gibner (*Physics*) B.A., Rice University 1983; M.S., California Institute of Technology 1987.  
Thesis: Isotopic Composition of Galactic Cosmic Ray Boron, Carbon, Nitrogen, and Oxygen.
- John Richard Gilbert (*Physics*) A.B., M.A., Harvard College 1980.  
Thesis: Soft X-ray Microimaging of Whole Wet Cells.
- Vojkan Jakić (*Mathematics*) B.S., University of Belgrade 1987.  
Thesis: Solutions to Some Problems in Mathematical Physics.
- Helen Margaret Johnston (*Astronomy*) B.Sc., University of Sydney 1986.  
Thesis: Compact Objects in the Disk and Globular Clusters.
- Cathleen Elaine Jones (*Physics*) B.S., Texas A&M University 1982; M.S., California Institute of Technology 1987.  
Thesis: A Measurement of the Spin-Dependent Asymmetry in Quasielastic Scattering of Polarized Electrons from Polarized  $^3\text{He}$ .
- Gunnar Ulrich Klinkhammer (*Physics*) Vordiplom (*Mathematics*), Vordiplom (*Physics*), Westfälische Wilhelms-Universität Münster 1986; M.S., California Institute of Technology 1989.  
Thesis: Multiply Connected Spacetimes and Closed Timelike Curves in Semiclassical Gravity.
- Ramin Naimi (*Mathematics*) B.A., University of California, Los Angeles 1987.  
Thesis: Constructing Essential Laminations in Some 3-Manifolds.
- Deborah Lynne Padgett (*Astronomy and Planetary Science*) A.B., Princeton University 1984.  
Thesis: Photospheric Abundance Analysis of Low Mass Pre-Main Sequence Stars.
- David Palmer (*Physics*) B.S., B.Eng., University of Washington 1984.  
Thesis: Gamma-Ray Imaging Observations of Supernova 1987A.
- Nantian Qian (*Mathematics*) B.S., Nanjing University 1982; M.S., 1985.  
Thesis: Rigidity Phenomena of Group Actions on a Class of Nilmanifolds and Anosov  $R^n$  Actions.
- Stuart Alexander Ridgway (*Physics*) A.B., University of California, Berkeley 1986; M.S., California Institute of Technology 1989.  
Thesis: Wormholes in Euclidean Quantum Gravity.
- Christopher A. Shera (*Physics and Neurobiology*) B.A., Haverford College 1983.  
Thesis: Listening to the Ear.
- Steinn Sigurdsson (*Physics*) B.S., University of Sussex 1986; M.S., California Institute of Technology 1988.  
Thesis: Dynamics of Neutron Stars and Binaries in Globular Clusters: or Ménage à Trois: Revitalizing Burnt Out Degenerates through Partner Swapping.
- M. Jamil Din Tahir-Kheli (*Physics*) B.A., Oriel College, Oxford University 1985; M.S., California Institute of Technology 1986.  
Thesis: The Infinite Range Heisenberg Model and High Temperature Superconductivity.

DOCTOR OF PHILOSOPHY — *Continued*

Shu-Wu Wu (*Physics*) B.S., Zhejiang University 1984; M.S., University of Wisconsin-Milwaukee 1986.

Thesis: Semiconductor Laser Noise and Linewidth Reduction and Rayleigh Scattering in Optical Fibers.

Lin Zuo (*Astronomy*) B.S., Lanzhou University 1981; M.S., Nanjing University 1984.

Thesis: QSO Absorption Lines and the Ionizing Field at High Redshifts.

# Prizes and Awards

## FREDERIC W. HINRICHS, JR., MEMORIAL AWARD

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

*Randall William Stevenson*

## THE 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.*

## THE WILLIAM F. BALLHAUS PRIZE

Awarded to aeronautics students for outstanding doctoral dissertations.

*Balasubramanya T. Nadiga*

## ERIC TEMPLE BELL UNDERGRADUATE MATHEMATICS RESEARCH PRIZE

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

*Michael George Maxwell; Robert G. Southworth*

## ROLF BUHLER AWARD

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

*Michael William Vanik*

*Prizes and awards are listed only for those students awarded degrees in 1992, and include prizes and awards received by them in previous years.*

## PRIZES AND AWARDS — *Continued*

### CALTECH PRIZE SCHOLARSHIPS AND CARNATION SCHOLARSHIPS

Each year Caltech awards these prizes for academic excellence. 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. Listed below are graduating seniors who have been recipients of these prizes.

<i>Jeannie Ellen Barrett</i>	<i>Michael Gideon Greenblatt</i>	<i>Jon Damien Pelletier</i>
<i>Jack Kyle Boyce</i>	<i>Christopher Mark Ho</i>	<i>Betty Kong-Ling Pun</i>
<i>William Nielsen Brandt</i>	<i>Zhirong Huang</i>	<i>Christopher D. Rosin</i>
<i>A. Raghava Chari</i>	<i>Mark Thomas Lakata</i>	<i>Andrew Joseph Stevens</i>
<i>Ti-Ming Chiang</i>	<i>Robert Bumju Lee</i>	<i>Jun Teng</i>
<i>David Marcel Cutrer</i>	<i>Edward Roger Lew</i>	<i>Christopher George Tully</i>
<i>Stephen Anthony Edwards</i>	<i>Dong Lin</i>	<i>Deron Andrew Walters</i>
<i>Teresa Lucille Engelhard</i>	<i>Michael George Maxwell</i>	<i>James Henry Werner</i>
<i>Daniel John Flees</i>	<i>Alfredo Martin Morales</i>	
<i>Tracy C. Fu</i>	<i>Jonathan Nader Pakianathan</i>	

### 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 math.

*Ramin Naimi*

### 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.

*Gary Steven Guthart*

### DONALD S. CLARK MEMORIAL AWARDS

May be awarded to a sophomore and a junior in recognition of service to the campus community and good academic performance. Preference is given to students in the Division of Engineering and Applied Science and to those in Chemical Engineering.

1991 *Eric Alan Stout; Elizabeth L. Wang*

## PRIZES AND AWARDS — *Continued*

### DEANS' CUP AND MASTERS' CUP

Two awards, selected by the Deans and Masters respectively, 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.

*Karin Melinda Johnson, Deans' Cup*

*Timothy Bradford Maddux, Masters' Cup*

*Emmeline Christine Naranjo, Masters' Cup*

*Sherwood Lan Smith, Deans' Cup*

### 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.

*Raffi Van Aroian*

### HAREN LEE FISHER MEMORIAL AWARD IN JUNIOR PHYSICS

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

*1991 Christopher George Tully*

### 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.

*1991 David Marcel Cutrer*

### 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.

*1991 Christopher Mark Ho; Alfredo Martin Morales*

### GRADUATE DEAN'S AWARD FOR OUTSTANDING COMMUNITY SERVICE

Awarded to a PhD 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.

*Craig S. Steele*

PRIZES AND AWARDS — *Continued*

GEORGE W. GREEN MEMORIAL PRIZE

Awarded to the undergraduate student who, in the opinion of the division chairmen, has shown outstanding ability and achievement in creative scholarship.

1991 *David Marcel Cutrer; Christopher George Tully*

1992 *William Nielsen Brandt ; Jon Damien Pelletier*

ARTUR MAGER PRIZE IN ENGINEERING

Awarded to a senior in engineering who has shown excellence in scholarship and the promise of an outstanding professional career.

*David Marcel Cutrer*

THE HERBERT NEWBY McCOY AWARD

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

1991 *Christopher B. Gorman*

1992 *Lynda K. Johnson*

MARY A. EARL McKINNEY PRIZE IN LITERATURE

The purpose of this prize is to cultivate proficiency in writing. It may be awarded for essays submitted in connection with regular literature classes or awarded on the basis of a special essay contest.

1990 *Jonathan Nanda Liljeblad*

1991 *Deepinder K. Brar*

ROBERT L. NOLAND LEADERSHIP SCHOLARSHIP

Awarded to 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.

*Andrea Francine Mejia*

HERBERT J. RYSER MEMORIAL SCHOLARSHIPS

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

1990 *A. Raghava Chari; Jun Teng*

1991 *Jonathan Nader Pakianathan*

PRIZES AND AWARDS — *Continued*

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.

1991 *Alfredo Martin Morales*

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 Aeronautical Laboratories of the California Institute of Technology). Preference is given to students working in structural mechanics.

1991 *Riccardo Bonazza*

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.

1989 *Teresa Lucille Engelhard*

1990 *Deepinder K. Brar*

1991 *Swagato Banerjee; David Aaron Matzner Dominguez*

SIGMA XI AWARD

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

*Tracy C. Fu*

THE MORGAN WARD PRIZE

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

1988 *Robert G. Southworth*

CHARLES WILTS PRIZE

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

*Ian Andrew Galton*

PRIZES AND AWARDS — *Continued*

FREDERICK 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.

*1990 Michael Gideon Greenblatt*

*1991 Michael George Maxwell; Christopher Scott Raymond*

## CIT 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.*