Ninety-Second
Annual Commencement
June 13, 1986
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 masters, the doctors 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 gradations 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 boys and choir girls 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
Academic Procession

Chief Marshal, J. Kent Clark

Assistant Marshals
Christopher E. Brennen, Ph.D.         Robert W. Oliver, Ph.D.
Jenijoy La Belle, Ph.D.               Ward Whaling, Ph.D.
David S. Wood, Ph.D.

Faculty Officers
B. Vincent McKoy, Ph.D.              Eleanor M. Searle, Ph.D., D.M.S.
                                 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 DIVISIONS
THE DEANS
THE PROVOST
THE TRUSTEES
THE COMMENCEMENT CHAPLAIN
THE COMMENCEMENT SPEAKER
THE PRESIDENT
THE CHAIRMAN OF THE BOARD OF TRUSTEES
Program

PRESIDING . . . . . . . . . . Ruben F. Mettler, Ph.D.
Chairman of the Board of Trustees

ORGAN PRELUDE . . . . . . . Leslie J. Deutsch, Ph.D.

PROCESSIONAL . . . The Caltech Wind Ensemble Brass and Organ
William Bing, M.M., Conductor

INVOCATION . . . . . . The Reverend Norman V. Naylor
Throop Memorial Church

COMMENCEMENT ADDRESS . . . . Arnold O. Beckman, Ph.D.
Chairman, Beckman Instruments, Inc.
Chairman Emeritus, Board of Trustees, California Institute of Technology

MUSICAL SELECTION . . . . . . The Caltech Glee Clubs
"Hallelujah" from Messiah
Donald G. Caldwell, D.M.A., Conductor
George Frederick Handel

CONFERRING OF DEGREES . . Marvin L. Goldberger, Ph.D., D.H.L.
President
California Institute of Technology
PRESENTATION OF CANDIDATES FOR DEGREES

For the Degree of Bachelor of Science . . . Gary A. Lorden, Ph.D.
Dean of Students

For the Degree of Master of Science . . . Stirling L. Huntley, Ph.D.
Associate Dean of Graduate Studies

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

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

Biology . . . . . . . . . . . . . Norman H. Horowitz, Ph.D.
Professor of Biology, Emeritus

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

Engineering and Applied Science . . . Paul C. Jennings, Ph.D.
Division Chairman

Geological and Planetary Sciences . . . Peter J. Wyllie, Ph.D.
Division Chairman

Humanities and Social Sciences . . . David M. Grether, Ph.D.
Division Chairman

Physics, Mathematics and Astronomy . Edward C. Stone, Jr., Ph.D.
Division Chairman

CONCLUDING REMARKS . . . . . . President Goldberger

BENEDICTION . . . . . . . . . . . . Mr. Naylor

RECESSIONAL . . . The Caltech Wind Ensemble Brass and Organ

ORGAN POSTLUDE . . . . . . . . . . Leslie Deutsch
Candidates for Degrees

BACHELOR OF SCIENCE

Mark Scott Abel
St. Louis, Missouri
Physics

Kenneth Allen Adelman
Wilton, Connecticut
Engineering and Applied Science

David Sanders Agababa
Azusa, California
Electrical Engineering

Sanjay Kumar Agrawal
Hong Kong
Engineering and Applied Science

Armando Daniel Arias
Los Angeles, California
Engineering and Applied Science

Betsy Marlene Arnold
Salem, Oregon
Physics

Peter Dell Ashcroft
Reedley, California
Applied Physics

William David Banks
Ridgecrest, California
Mathematics

Michael E. Baumer
San Diego, California
Geophysics

Kenneth D. Bell III
Spokane, Washington
Biology

Mihir Bellare
Delhi, India
Mathematics

Karyn Jean Betzen
Tucson, Arizona
Biology

Robert James Bolender
Seattle, Washington
Engineering and Applied Science

Felice Faye Boris
Madison, Wisconsin
Biology

Jon Charles Brendsel
McLean, Virginia
Electrical Engineering

Daniel Shenon Briggs
Mill Valley, California
Applied Mathematics

Michael John Bronikowski
Milwaukee, Wisconsin
Chemistry and Mathematics

John Anthony Bruckner
Redlands, California
Engineering and Applied Science

Donald Allen Buchholz
Mt. Angel, Oregon
Chemical Engineering

Tom C. Bulgerin
Minneapolis, Minnesota
Physics

Brian D. Burk
Prairie Village, Kansas
Applied Physics

Margaret Caroline Carter
San Jose, California
Engineering and Applied Science

Dara Janine Chang
Cerritos, California
Engineering and Applied Science

Christopher Tuan Chen
Las Cruces, New Mexico
Physics

Scott Shouyu Chou
Norman, Oklahoma
Electrical Engineering

Tammy Lynn Choy
Wahiawa, Hawaii
Engineering and Applied Science

Carl Randall Clausen
Albuquerque, New Mexico
Chemistry

Oliver Michael Collins
Key West, Florida
Engineering and Applied Science

Karen Lynn Condie
Albuquerque, New Mexico
Mathematics

Lisa Ann Cummings
Denver, Colorado
Engineering and Applied Science

Alan Ronald Daughton
Syracuse, New York
Physics

Colette Pamela De Moor
Palo Alto, California
Chemical Engineering

Students whose names appear in boldface type are being graduated with honor in accordance with a vote of the faculty.
Deanna Jill Deeds  Carpinteria, California  Engineering and Applied Science
Larry Rudolph Doan  Huntington Beach, California  Electrical Engineering
Richard Edward Doherty  San Diego, California  Engineering and Applied Science
Robert Le Roy Dow, Jr.  Chevy Chase, Maryland  Chemical Engineering
Denise L. Draper  Seattle, Washington  Engineering and Applied Science
Arthur Duval  Escondido, California  Mathematics
Sean Roberts Eddy  Creekside, Pennsylvania  Biology
Laura L. Ekroo  Santa Barbara, California  Electrical Engineering
David Daniel Feldman  Los Angeles, California  Electrical Engineering
Harold John Felton  El Paso, Texas  Engineering and Applied Science
Fred Anthony Ferrante  Fremont, California  Chemical Engineering
Charles Michael Flagg  Seattle, Washington  Electrical Engineering
Diana Foss  Huntington Beach, California  Astronomy
Brian L. Foster  Capitolia, California  Mathematics and Engineering and Applied Science
John Theodore Fourkas  Sacramento, California  Chemistry
Robert Julius Franciosi  La Mirada, California  Geophysics
Jeanine Marie Gainey  Torrance, California  Engineering and Applied Science
David Forrest Gallup  Garden Grove, California  Engineering and Applied Science
Hideki Garren  Carson, California  Biology
Edward N. George  El Paso, Texas  Biology and Engineering and Applied Science
Supriya Ghosh  Forest Hills, Queens, New York City, New York  Engineering and Applied Science
George Garing Gibbs  Irvine, California  Biology and Chemistry
Ronald Arthur Gidseg  Albuquerque, New Mexico  Engineering and Applied Science
David Walton Gillespie  Mercer Island, Washington  Engineering and Applied Science
Paul Gilbert Gillespie  Sandy, Utah  Engineering and Applied Science and History
Warren George Goda  Orange, California  Electrical Engineering
Simon Godfrey Goldstein  Calgary, Alberta, Canada  Chemical Engineering
Michael Francis Graham, Jr.  Houston, Texas  Physics
Douglas Stuart Gray  Corvallis, Oregon  Engineering and Applied Science
Burnham Horace Greeley  Honolulu, Hawaii  Physics
Scott Alan Grossman  Upland, California  Physics
Ben Ha  Monterey Park, California  Electrical Engineering
John Michael Haack  Westlake Village, California  Engineering and Applied Science
Kenneth Kang Hee Hahn  Cupertino, California  Physics
James Robert Hamrick, Jr.  Sunnyvale, California  Electrical Engineering
Lynne Hannah  La Crescenta, California  Engineering and Applied Science
BACHELOR OF SCIENCE — Continued

Jonathan Douglas Happe  St. Anthony, Minnesota  Electrical Engineering
Jonathan David Hartzberg  New York, New York  Geophysics
James Edward Helgren  Glenview, Illinois  Engineering and Applied Science
Lisa Ellen Henderson  Pacific Grove, California  Electrical Engineering
Marc Herant  Paris, France  Physics
Hans Theodore Hermans  Wayne, Pennsylvania  Engineering and Applied Science
John Allen Herndon  Bakersfield, California  Engineering and Applied Science
Charles W. Hershey  Springfield, Illinois  Electrical Engineering and Physics
Robert Lynn Horn  Anaheim, California  Engineering and Applied Science
Bryan Donald Howard  Portland, Oregon  Engineering and Applied Science
Everett William Howe  Sacramento, California  Mathematics
Stephen Dao Hui Hsu  Ames, Iowa  Physics
Charles Ray Hu  Manhattan, Kansas  Engineering and Applied Science
Kwanghak Huh  Seoul, Korea  Engineering and Applied Science
David M. Hull  Lawrence, Kansas  Engineering and Applied Science and Mathematics
Nathan Noah Hurvitz  Los Angeles, California  Applied Physics
Jung Choon Im  Des Plaines, Illinois  Physics and Applied Mathematics
Dave Ku Kang  Torrance, California  Electrical Engineering
Scott Clark Karlin  Manhattan Beach, California  Electrical Engineering
Ara Kassabian  Los Angeles, California  Physics
Daniel Richard Kegel  Issaquah, Washington  Engineering and Applied Science and Biology
James Paul Kennedy  Birmingham, Alabama  Chemical Engineering
Sung Hoon Kim  Glendale, California  Engineering and Applied Science
Andrew Tsu-Ihsin King  Hollywood, California  Engineering and Applied Science
Peter Francis Xavier Konopka  Smithtown, New York  Physics
Chris Duro Koresko  Overland Park, Kansas  Physics
Joseph Michael Kovalik  Montreal, Quebec, Canada  Physics
Frank Ernest Kragh  Goshen, New York  Electrical Engineering
Ashok Venketaraman Krishnamoorthy  Madras, India  Engineering and Applied Science
Rajeev Krishnamoorthy  Calcutta, India  Engineering and Applied Science
Santosh Narayanan Krishnan  Trivandrum, India  Biology
Mark Alan Laffoon  Ottawa, Canada  Geochemistry
Stephen John Lalli  Portland, Oregon  Electrical Engineering
Thientu Thi Lam  Riverside, California  Chemical Engineering
Heidi Jo Langeberg  Sebastopol, California  Electrical Engineering
Taylor Walton Lawrence  Montevallo, Alabama  Physics
Sandra Lynn Lee  Berkeley, California  Chemistry
Jeffrey A. Lester  Portland, Oregon  Electrical Engineering
Adam Henry Lewenberg  Ventura, California  Mathematics
Victor Leyva  Los Angeles, California  Physics
Drew Thomas Lindberg  Long Beach, California  Physics
James T. Liu  Glenview, Illinois  Physics
Daniel Elliott Loeb  Skokie, Illinois  Mathematics
Sylvia Luedeking  Pullman, Washington  Mathematics
Thomas Cho-Tak Luke  Ottawa, Ontario, Canada  Physics
Brian J. Lund  Novato, California  Physics
Marie-Yvette Madrid  Glendale, California  Chemical Engineering
Alan Kazunari Marumoto  Torrance, California  Chemistry
Takako Matoba  New York, New York  Engineering and Applied Science
Mark McDonald  Rochester, New York  Applied Physics
Michael J. McDowell  Tucson, Arizona  Electrical Engineering
Janet Mary McWaid  West Los Angeles, California  Electrical Engineering
Samuel Thomas Megeath  Las Cruces, New Mexico  Physics
Brian Douglas Metscher  Dallas, Texas  Geophysics
Henry L. Meuret III  Prosser, Washington  Electrical Engineering
Salman Mitha  Karachi, Pakistan  Physics
Steven Edward Molnar  Webster Groves, Missouri  Electrical Engineering
Milagros Montalvo  Guaynabo, Puerto Rico  Engineering and Applied Science
Mario Alberto Montessori  Vancouver, British Columbia, Canada  Engineering and Applied Science
Lee Anna Rochelle Moreland  Gig Harbor, Washington  Engineering and Applied Science
Esther Proctor Morss  Beverly Farms, Massachusetts  Engineering and Applied Science
Brandon Jay Mynudes  Decatur, Georgia  Electrical Engineering
Derrick H. Nguyen  San Francisco, California  Electrical Engineering
Yannis Nikoleris  Thessaloniki, Greece  Engineering and Applied Science
Eric M. Olafson  East Islip, New York  Engineering and Applied Science
Kim Chi-King Pao  Hong Kong  Engineering and Applied Science
Sung Min Park  Tustin, California  Chemical Engineering and Biology
Janice Diane Pata  Lompoc, California  Biology
Massoud Pedram  Pasadena, California  Electrical Engineering
Matthew Penn  Seymour, Connecticut  Astronomy
Tracy Vaughn Petersen  Sacramento, California  Engineering and Applied Science
Karla Anne Peterson  Warwick, Rhode Island  Geophysics
BACHELOR OF SCIENCE — Continued

Deborah Shari Pinck  Northridge, California  Electrical Engineering
Kenneth Allen Poppleton  Enumclaw, Washington  Electrical Engineering
Brian Scott Porter  Port Ludlow, Washington  Electrical Engineering
Steve Rabin  New York City, New York  Mathematics
Irene Louise Replogle  Hopkins, Minnesota  Engineering and Applied Science
Michael Anthony Rigler  Helena, Montana  Physics
David Wayne Ring  West Seneca, New York  Physics
Stephen Daniel Ritchie  Boston, Massachusetts  Chemical Engineering
Michael J. Roberts  Midland, Michigan  Physics
John Paton Rostykus  Bellevue, Washington  Electrical Engineering
Gary Scott Rowland  Raytown, Missouri  Engineering and Applied Science
Steve Scot Roy  El Paso, Texas  Physics
Janice Fusae Sakai  Gardena, California  Biology
Sarah Jane Santoro  Rocky Point, New York  Engineering and Applied Science
Steven Bradley Sawkins  San Gabriel, California  Mathematics
Janet Marie Saylor  Worcester, Massachusetts  Physics
Johannes Patrick Schmidt  Boulder, Colorado  Engineering and Applied Science
Fred Christian Schock  Seattle, Washington  Engineering and Applied Science
Marc Philip Schuyler  Tarzana, California  Engineering and Applied Science and Social Science
Joel Aaron Seely  Lakewood, California  Physics
Se Jung Shin  Downey, California  Biology
Steve S. Shin  Glendale, California  Engineering and Applied Science and Biology
Lawrence Ralph Siegel  Plainview, New York  Applied Physics
Everett Fuerb Simons  Parsippany, New Jersey  Engineering and Applied Science
Lisa Lorraine Skrumeda  Salem, Oregon  Physics
Milton Rudolph Smith III  Bethany, West Virginia  Chemistry
Sherry Lynn Smith  Stroudsburg, Pennsylvania  Astronomy
Myles Andrew Sussman  Denver, Colorado  Engineering and Applied Science
Andrew C. Swanson  Bethel Park, Pennsylvania  Applied Physics
Michael Lawrence Takayama  Fresno, California  Engineering and Applied Science
Jonathan King Tash  Tucson, Arizona  Physics and Mathematics
Steven Dion Thomas  Tahlequah, Oklahoma  Electrical Engineering
Brian James Tsai  Taipei, Taiwan  Chemical Engineering
Yosufi Mohamed Tyebkhan  Hong Kong  Engineering and Applied Science
Thomas Lee Tysinger  Macungie, Pennsylvania  Engineering and Applied Science
Rodney Doyle Van Meter III  Williamson, West Virginia  Engineering and Applied Science
Samuel Sheng-Hung Wang  Riverside, California  Physics
Joy Kimi Watanabe  Seattle, Washington  Applied Physics
Ryoji Watanabe  Mountain View, California  Physics
David Gregg Wernitz  Muskogee, Oklahoma  Engineering and Applied Science
Robert Theodore Weaver  Idyllwild, California  Applied Physics
Robin Darryl Whitt  Vienna, Virginia  Engineering and Applied Science
Kevin Earl Wilson  Strathmore, California  Physics
Robin Katherine Wilson  Ventura, California  Biology
Yiu-Fai Isaac Wong  Hong Kong  Electrical Engineering and Mathematics
Thomas Wilson Workman  Los Angeles, California  Physics
John Mark Wright  Sumner, Washington  Electrical Engineering
Ming jim Wu  Oceanside, California  Chemistry
Michael Thomas Yamada  Carson, California  Chemistry
Joseph Yang  Alexandria, Virginia  Engineering and Applied Science
Kaming Wilson Yee  Sacramento, California  Engineering and Applied Science
Chang Dong Yoo  Seoul, Korea  Engineering and Applied Science
Amy Mitsue Yoshida  Kailua, Hawaii  Electrical Engineering
Paul Michael Young  North Hampton, New Hampshire  Applied Physics
Hsiu-Tung Yu  Palo Alto, California  Electrical Engineering
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Dennis Fabian Zaritsky  Whittier, California  Physics
MASTER OF SCIENCE


Hojin Ahn (Mechanical Engineering) B.S., California Institute of Technology 1985.

Khaled Amer (Electrical Engineering) B.Sc., Cairo University 1980.

Robert Christopher Anderson III (Electrical Engineering) A.B., Occidental College 1984; B.S., California Institute of Technology 1984.


Douglas D. Axe (Chemical Engineering) B.S., University of California, Berkeley 1984.


Mark Lewis Baldwin (Mechanical Engineering) B.S., California State University, Long Beach 1985.

Brenda Janet Baldwin-Zuschke (Chemistry) B.S., Tulane University 1981.


Nicholas Bates Bauer (Environmental Engineering Science) B.S., University of Virginia 1981.


James Maxwell Berman (Electrical Engineering) B.S., University of California, Los Angeles 1979.


Faruk Bilalovic (Electrical Engineering) B.Sc., University of Sarajevo 1975.

Dražen Borković (Electrical Engineering) B.Sc., University of Belgrade 1985.


Alan Livingston Bostick (Physics) B.S., University of Washington 1984.


Dan Khoa Bui (Electrical Engineering) B.S.E.E., The University of Texas at Austin 1985.

Lawrence Martin Burns (Electrical Engineering) B.S.E.E., University of Maryland 1982.

Gregory Scott Cardell (Aeronautics) B.A., Reed College 1981.

Scott Allen Carr (Aeronautics) B.S., University of Massachusetts at Amherst 1985.

Deborah Reich Castleman (Electrical Engineering) B.S., California State Polytechnic University, Pomona 1981.
MASTER OF SCIENCE — Continued

Wingsin Richard Chan  (Mechanical Engineering)  S.B., Massachusetts Institute of Technology 1985.
Chi-Chao Chao  (Electrical Engineering)  B.S., National Taiwan University 1983.
Wei Chen  (Civil Engineering)  B.S., Tongji University 1982.
Tzi-Dar Chu  (Electrical Engineering)  B.S., National Taiwan University 1983.
Piranart Chokwatana  (Chemical Engineering)  B.Eng., Chulalongkorn University 1984.
David Hsiingkuo Chow  (Applied Physics)  B.S., Case Western Reserve University 1984.
Sung Hwan Chun  (Electrical Engineering)  B.E., Yonsei University 1984.
Youn Hoon Chung  (Electrical Engineering)  B.S., California Institute of Technology 1985.
John Timothy Coffey  (Electrical Engineering)  B.E., University College Dublin 1985.
Timothy Richard Colvin  (Applied Mathematics)  A.B., University of California, Berkeley 1981.
Uma Devi Dasika  (Electrical Engineering)  B.S., Rutgers, The State University 1983.
Steven William Drost  (Electrical Engineering)  B.S., University of Lowell 1984.
Christopher John Eich  (Physics)  B.S., University of Santa Clara 1983.
Kent Franklin Evans  (Astronomy)  B.S., California Institute of Technology 1983.
Brian Andrew Fagan  (Mechanical Engineering)  B.S., University of California, Irvine 1985.
Mary Kay Kramer Flagg  (Chemical Engineering)  B.S., Rice University 1984.
David Smith Folweiler  (Electrical Engineering)  B.S.E.E., University of Massachusetts at Amherst 1985.
John Theodore Fourkas  (Chemistry)  B.S., California Institute of Technology 1986.
MASTER OF SCIENCE — Continued


Douglas Read Gault (Electrical Engineering) B.S., United States Military Academy 1977.


Philip Charles Haubert (Physics) B.S., Michigan State University 1983.

Roland Edward Heersink (Chemical Engineering) B.Sc., University of Alberta 1982.

Steinar Hetland (Civil Engineering) Siv. Ing., Norwegian Institute of Technology 1980.

Michael Eugene Hoenk (Physics) B.S. (Physics), University of Iowa 1984; B.S. (Mathematics), 1984.

Watche Stepan Hoknayan (Electrical Engineering) M.S.E., Polytechnic Institute of Yerevan 1979.


Tyler Lee Houzel (Materials Science) B.S., Rensselaer Polytechnic Institute 1983.

Raymond Scott Hudson (Electrical Engineering) B.S., California Institute of Technology 1985.


Justin Tsz Ching Ip (Chemical Engineering) S.B., Massachusetts Institute of Technology 1984.


Steven Joseph Jordan (Applied Mathematics) B.S., University of Massachusetts at Amherst 1979.


Andrew T. King (Electrical Engineering) B.S., California Institute of Technology 1986.
MASTER OF SCIENCE — Continued

Elias Kiritsis (Physics) B.S., University of Athens 1984.
Brian Scott Kirking (Civil Engineering) B.S.C.E., University of Southern California 1983.
Vitaly Kupisk (Mathematics) B.S., California Institute of Technology 1982.
John Paul Lazzaro (Computer Science) B.S.(Electrical Engineering), University of Pennsylvania 1984; B.S.(Computer Science Engineering), 1984.
Stephen Douglas Lee (Chemistry) B.S., University of California, Davis 1984.
Lingyun Lu (Aeronautics) B.S., Beijing Institute of Aeronautics and Astronautics 1983.
William Lee Lyons (Chemical Engineering) B.S., University of California, Santa Barbara 1980.
John Douglas McGill (Physics) B.S., Massachusetts Institute of Technology 1983.
Arie M. Michelsohn (Biology) A.B., Columbia University 1982.
Franklin Perry Mills (Physics) B.S.E., Princeton University 1984.
Azita Mohammadi (Electrical Engineering) B.S., California State University, Northridge 1984.
Frank Edward Mullen (Electrical Engineering) B.S., United States Coast Guard Academy 1979.
Dwight Matthew Munk (Electrical Engineering) B.S., University of Southern California 1980.
MASTER OF SCIENCE — Continued

Thomas Joseph Nadeau (Electrical Engineering) B.S.E.E., Clemson University 1985.
Russell Lawrence Natter (Chemical Engineering) B.S., California Institute of Technology 1985.
Ricky Chiu-Yin Ng (Chemical Engineering) B.S., University of Houston 1983.
Tak-Kwong Ng (Computer Science) B.E., The Cooper Union 1975; M.S.E.E., Syracuse University 1976.
Truong Quang Nguyen (Electrical Engineering) B.S., California Institute of Technology 1985.
Paul Scott Northrop (Chemical Engineering) B.S., Washington University 1983.
Jonathan Alan Nurse (Geology) B.S., Colorado School of Mines 1983.
Janardan Gangadhar Padale (Civil Engineering) B.S., Ahmednagar College 1957; M.S., University of Poona 1965.
Tanya Peratis Pemberton (Aeronautics) S.B., Massachusetts Institute of Technology 1985.
Thomas Lee Power (Civil Engineering) B.S.C.E., The University of Texas at Austin 1985.
Todd Michael Przybycien (Chemical Engineering) B.S., Washington University 1984.
Todd Christopher Pulvino (Mechanical Engineering) B.S., University of Wisconsin-Madison 1984.
Charles Byron Pursell (Electrical Engineering) B.S., Purdue University 1985.
Marco Rasi (Civil Engineering) Ingegneria Civile-Sezione Idraulica, Università Degli Studi di Pisa 1984.
Brian K. Rasnow (Physics) B.S., California Polytechnic State University, San Luis Obispo 1984.
Michael Allen Rider (Chemistry) B.S., University of Southern California 1983.
MASTER OF SCIENCE — Continued


David Lawrence Schweizer (Computer Science) B.S., Yale College 1984.


James Earle Shisley (Applied Mathematics) B.S., California State University, Northridge 1984.

Martin Siegel (Electrical Engineering) B.S., California State Polytechnic University, Pomona 1984.


Massimo Anthony Sivilotti (Computer Science) B.S., Queen’s University 1983.


Mary Christine Stordal (Geochemistry) B.S., Texas A&M University 1979; M.S. 1981.


Douglas Kelvin Thompson (Chemistry) B.S., Abilene Christian University 1983.

Phillip Takeo Tokumaru (Aeronautics) B.S.E., University of Pennsylvania 1985.

Yasuo Tomita (Electrical Engineering) B.S., Hokkaido University 1978; M.S., 1980.

Thomas Lee Tysinger (Aeronautics) B.S., California Institute of Technology 1986.


Kevin Spencer Van Horn (Computer Science) B.S.(Physics), University of Utah 1982; B.S.(Computer Science), 1982.

Brian Paul Von Herzen (Computer Science) A.B., Princeton University 1980.

William Wayne Wauford (Electrical Engineering) B.S., University of South Florida 1985.

Shirley Jeannine Whitmore (Chemical Engineering) B.S.(Chemical Engineering), The University of Tulsa 1982; B.S.(Applied Mathematics), 1982.


Karl Dane Wittrup (Chemical Engineering) B.S.Ch.E., University of New Mexico 1984.


Fulin Xiong (Applied Physics) B.Sc., Chengdu College of Geology 1982.

Yat Wah Yiu (Electrical Engineering) B.S., University of Texas at Austin 1985.

MASTER OF SCIENCE — Continued

Eddy Ka Ping Young (Electrical Engineering) B.Sc., Loughborough University of Technology 1984.
Lin Zhang (Electrical Engineering) B.S., Xi’an Jiaotong University 1982.

ENGINEER

Janet Elizabeth Freeman (Aeronautical Engineer) S.B., Massachusetts Institute of Technology 1978; M.S., California Institute of Technology 1984.
Kazunori Kawasaki (Aeronautical Engineer) B.S., Kyoto University 1976; M.S., California Institute of Technology 1984.
DOCTOR OF PHILOSOPHY

DIVISION OF BIOLOGY

Mark Knowles Bennett (Neurobiology)  B.S., Oregon State University 1981.
   Thesis: Brain Type II Calcium and Calmodulin-Dependent Protein Kinase: Purification, Characterization and Molecular Cloning.

Madeline Anne Crosby (Molecular Biology)  B.S., University of California, Davis 1975.

   Thesis: Class I Genes of the Major Histocompatibility Complex: Structural Studies on Genes of the Tla Locus.

George Loweree Gaines, III (Biology)  B.S., Yale University 1979.

Boning Gao (Molecular Biology)  B.S., Peking University 1976.
   Thesis: The Structure and Expression of the Gene Coding for Bindin, a Species Specific Sea Urchin Protein.

James Joseph Lee (Biology)  B.S., State University of New York at Stony Brook 1980.


Paul Wells Meyer (Biophysics)  B.S., California Institute of Technology 1979.

Robert Edwin Pruitt (Molecular Biology)  B.S., University of Minnesota 1980.

Yi Henry Sun (Molecular Biology)  B.S., National Taiwan University 1978.

Astar Winoto (Molecular Biology)  B.A., University of California, Berkeley 1981.

DIVISION OF CHEMISTRY AND CHEMICAL ENGINEERING

Alan Brad Anton (Chemical Engineering)  B.S., Virginia Polytechnic Institute and State University 1979; M.S., California Institute of Technology 1982.

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

19
DOCTOR OF PHILOSOPHY — Continued

David Nathan Beratan (Chemistry) B.S., Duke University 1980.  
Thesis: The Theory of Long Distance Charge Transfer Reactions.

David Francis Blair (Chemistry) A.B., Princeton University 1979.  
Thesis: Progress Toward Elucidating the Mechanisms of Energy Transduction in  
Cytochrome c Oxidase.

Geoffrey A. Blake (Chemistry) B.S., Duke University 1981.  

Robert J. Cave (Chemistry) B.S., Michigan State University 1979.  

Francis Gabriel Celi (Chemistry) B.A., La Salle College 1979.  
Thesis: I. IR Photodissociation Spectroscopy of Large van der Waals Clusters  
II. UV Laser-Induced Photochemistry of Fe(CO)₅ on Single Crystal Surfaces.

Bo Kyung Chi (Chemical Engineering) B.S., Massachusetts Institute of Technology 1979.  

Paul N. Dunlap (Chemical Engineering) B.S.Chem.E., University of Colorado 1978;  
M.S., California Institute of Technology 1981.  

Constantin George Economou (Chemical Engineering) Diploma, National Technical University of Athens 1983.  

Walther Robert Ellis, Jr. (Chemistry) B.A., University of Miami 1978; B.S., 1978;  
M.S., 1980.  
Thesis: Spectroelectrochemical Studies of Heme and Copper Proteins.

Thesis: Synthesis and Reactivity of Transition Metal Methylidene Complexes.

Lynn Forester (Chemical Engineering and Chemistry) B.A., University of California,  
Santa Cruz 1978; M.S., California Institute of Technology 1980.  
Thesis: An Inelastic Electron Tunneling Spectroscopic Study of the Interactions of  
Cyclic Hydrocarbons with a Zirconium Polymerization Catalyst Supported on  
Aluminum Oxide.

Thesis: An Inelastic Electron Tunneling Spectroscopic Investigation of Inorganic and  
Organometallic Molybdenum Complexes Adsorbed on Aluminum Oxide Surfaces.

Anthony Sigmund Geller (Chemical Engineering) B.S.E., Princeton University 1979.  
Thesis: A Study of the Creeping Motion of a Sphere Normal to a Deformable Fluid-  
Fluid Interface: Deformation and Breakthrough.

DOCTOR OF PHILOSOPHY — Continued


DOCTOR OF PHILO SOPHY — Continued

Jin-ho Seo (Chemical Engineering) B.S., Seoul National University 1976; M.S., Korea Advanced Institute of Science 1978.

Gerald Siu (Chemistry) B.S., University of Maryland 1980.
   Thesis: Antigen Receptors on Lymphocytes.

Michael Glenn Smith (Chemistry) B.S., Texas A&M University 1980.
   Thesis: Approaches to the Syntheses of the Acyltetramic Acid Antibiotics Striptolydigin, Tirandamycin A, and Tirandamycin B.


Alan Paul Sylwester (Chemistry) B.S., University of California, Riverside 1978.
   Thesis: Matrix Isolation and Characterization of 1,1-Diazenes.

Mark Edward Thompson (Chemistry) B.S., University of California, Berkeley 1980.

Margaret A. Tolbert (Chemistry) B.A., Grinnell College 1979; M.S., University of California, Berkeley 1982.
   Thesis: Mechanisms and Energetics of Alkane Activation by Transition Metal Ions in the Gas Phase.

Michael David Varney (Chemistry) B.S., University of California, Los Angeles 1980.

Robert Budge Wardle (Chemistry) B.S., Utah State University 1981.

Dale Ross Warren (Chemical Engineering) B.S., Clarkson College of Technology 1979.

DIVISION OF ENGINEERING AND APPLIED SCIENCE

Khaled Ahmed Sabry Abdel-Ghaffar (Electrical Engineering) B.Sc., Alexandria University 1980; M.S., California Institute of Technology 1983.
   Thesis: An Information- and Coding-Theoretic Study of Bursty Channels with Applications to Computer Memories.
DOCTOR OF PHILOSOPHY — Continued

Douglas Ray Adkins  (Mechanical Engineering)  B.S., University of Louisville 1979; M.Eng., 1980.


Thesis: Investigations of Atomic Transport Induced by Heavy Ion Irradiation.

Christopher Louis Barrett  (Engineering Science/Bioinformation Systems)  B.S., University of New Mexico 1976; M.S., California Institute of Technology 1983.

Thesis: Some Issues in the Kinematics of Finite Deformations.

William Michael Bruno  (Electrical Engineering)  B.S., University of California, San Diego 1981; M.S., California Institute of Technology 1983.
Thesis: Powder Core Dielectric Waveguides.

Thesis: Thermodynamics, Kinetics and Mechanisms of the Reactions of S(IV) with Cu(II) and Fe(III).


Sayed-Amr El-Hamamsy  (Electrical Engineering and Computer Science)  B.Sc., Cairo University 1979; B.Sc., Ain Shams University 1981; M.S., California Institute of Technology 1982.
Thesis: Coupled-Inductor Inversion, Rectification and Cycloconversion.

Thesis: Control of Atmospheric Fine Primary Carbon Particle Concentrations.
DOCTOR OF PHILOSOPHY — Continued


  Thesis: Infrared Optical Studies of HgTe-CdTe Superlattices and GaAs.

Nicholas Patrick Jones  *(Civil Engineering)*  B.E., University of Auckland 1980; M.S., California Institute of Technology 1981.


  Thesis: Optical Interactions in a Dielectric Material with Multiple Perturbations.


Peyyun Peggy Li  *(Computer Science)*  B.S., National Taiwan University 1976; M.S., 1979.
  Thesis: A Parallel Execution Model for Logic Programming.

Richard Craig Mosteller  *(Computer Science)*  B.S., Northrop Institute of Technology 1968; M.S., California Institute of Technology 1981.
  Thesis: Monte Carlo Methods for 2-D Compaction.


  Thesis: Analysis of Unanchored Liquid Storage Tanks under Seismic Loads.

DOCTOR OF PHILOSOPHY — Continued

Thesis: Optical and Opto-Electronic Investigations of Semiconductor Defects and Heterostructures.


Thesis: Analysis and Demonstration of the Quantile Vocoder.

Constantine Emmanuel Synolakis  (Civil Engineering)  B.S., California Institute of Technology 1978; M.S., 1979.

Thiam-Soon Tan  (Civil Engineering)  B.E., University of Canterbury 1979; M.S., California Institute of Technology 1982.

Thesis: Integrated Optical Motion Detection.

Thesis: The Effects of Large-Eddy Manipulator Devices on the Turbulent Spot and the Turbulent Boundary Layer.


DOCTOR OF PHILOSOPHY — Continued

Thesis: Sliding Mode Control of Power Converters.


Chung-en Zah (Electrical Engineering) B.S., National Taiwan University 1977; M.S., 1979; M.S., California Institute of Technology 1982.

Jeffrey Alan Zelt (Civil Engineering) B.Sc., University of British Columbia 1980; M.S., California Institute of Technology 1981.


DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES

Holly Kathleen Eissler (Geophysics) B.S., University of Illinois at Urbana-Champaign 1979; M.S., California Institute of Technology 1982.
Thesis: Investigations of Earthquakes and Other Seismic Sources in Regions of Volcanism.

Gerald Jonathan Fine (Geology) B.A., Amherst College 1980.
Thesis: Carbon Dioxide in Synthetic and Natural Silicate Glasses.

George Ellery Gehrels (Geology) B.S., University of Arizona 1978; M.S., University of Southern California 1980.

Thesis: Shear Velocity Structure of the Mantle Beneath the North American Plate.

Mark Alan Richards (Geophysics) B.S., University of Texas at Austin 1977; M.S., California Institute of Technology 1978.

Sally Miranda Rigden (Geology) B.Sc., Australian National University 1977; M.S., California Institute of Technology 1981.
DOCTOR OF PHILOSOPHY — Continued

David Bruce Sams (Geochemistry) B.S., University of California, Irvine 1977; M.S., California Institute of Technology 1980.
Thesis: U/Pb Zircon Geochronology, Petrology, and Structural Geology of the Crystalline Rocks of the Southernmost Sierra Nevada and Tehachapi Mountains, Kern County, California.

Ray James Weldon II (Geology) B.A., Pomona College 1977.
Thesis: The Late Cenozoic Geology of Cajon Pass; Implications for Tectonics and Sedimentation along the San Andreas Fault.

Thesis: Empirical Relations Between the Earth's Radiation Budget, Cloudiness, and Various Meteorological Parameters.

DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

Jeffrey Scot Banks (Social Science) B.A., University of California, Los Angeles 1982; M.S., California Institute of Technology 1984.

Paul Anders Bjorn (Social Science) B.A., University of Iowa 1976.
Thesis: Games in Econometrics with Applications to Labor Economics.

Da-Hsiang Donald Lien (Social Science) B.S., National Tsing-Hua University 1975; M.S., National Chiao-Tung University 1979.
Thesis: Essays on Speculation and Futures Markets.

DIVISION OF PHYSICS, MATHEMATICS AND ASTRONOMY

Ian Gareth Angus (Physics) B.S., Victoria University 1980; M.S., 1981.
Thesis: The $\Delta l=\frac{3}{2}$ Rule and the Strong Coupling Expansion.


Geoffrey Blewitt (Physics) B.S., Queen Mary College 1981.
Thesis: A Search for Free Proton Decay, and Nucleon Decay in $^4$He, using the Invariant Mass and Momentum of Exclusive Final States.
DOCTOR OF PHILOSOPHY — Continued


Mark Howard Goroff  (Physics) B.S., University of Connecticut 1980.
Thesis: The Ultraviolet Divergences of Einstein Gravity.

Brian F. Hatfield  (Physics) B.S., University of Minnesota 1977; M.S., University of California, Santa Cruz 1980.

Chi Fai Ho  (Mathematics) B.S., California State University, Hayward 1981.


Mark Alan Johnson  (Physics) A.B., Washington University 1981.

Adam Kolawa  (Physics) M.S., University of Mining and Metallurgy 1981; M.S., Jagiellonian University 1982.

Sze-Keung Kwong  (Physics) B.Sc., University of Hong Kong 1980; M.A., University of Southern California 1981.


Thesis: Neural Networks, Pattern Recognition, and Fingerprint Hallucination.


Brian John Newport  (Physics) B.Sc., Victoria University of Wellington 1979; B.Sc., (Honours) 1980.
DOCTOR OF PHILOSOPHY —Continued

Volker Pönnisch (Physics) Vordiplom, Universität Kiel 1979; M.S., Indiana University 1980.

Taje Indrallall Ramsamujh (Mathematics) B.Sc., Imperial College of Science and Technology, University of London 1982; M.S., California Institute of Technology 1984.
Thesis: Some Topics in Descriptive Set Theory and Analysis.


Thesis: Damping Ring for the SLAC Linear Collider.


Joseph John Rushanan (Mathematics) B.S., M.S., The Ohio State University 1982.
Thesis: Topics in Integral Matrices and Abelian Group Codes.


Michael Ben Weimer (Physics) S.B., Massachusetts Institute of Technology 1976; M.S., California Institute of Technology 1978.

Hitoshi Yamamoto (Physics) B.S., Kyoto University 1974.
Thesis: A Study of Charged D* Mesons Produced in e^+e^- Annihilations at $E_{cm}=29$ GeV.
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.
Recipient to be announced at Commencement.

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.
Harry Francis Robey III

MABEL BECKMAN PRIZE
Awarded to a woman student upon completion of her junior year in recognition of demonstrated academic and personal excellence, contributions to the Institute community, and outstanding qualities of character and leadership.
Jean C. Tang

ERIC TEMPLE BELL UNDERGRADUATE MATHEMATICS RESEARCH PRIZE
Awarded to one or more juniors or seniors for outstanding original research in mathematics.
Arthur Duval, senior; Everett W. Howe, senior

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.

Betsy Marlene Arnold  Everett William Howe  Myles Andrew Sussman
Mihir Bellare  Stephen Duo Hui Hsu  Yosuf Mohamed Tyebkhan
Margaret Caroline Carter  Jung Choon Im  Robin Katherine Wilson
Arthur Duval  Santosh Narayanan  Michael Thomas Yamada
Laura L. Ekroot  Krishnan  Paul Michael Young
Hideki Garren  Taylor Walton Lawrence  Hsiu-Tung Yu
Simon Godfrey Goldstein  Janice Fusae Sakai  Dennis Fabian Zaritsky

*The names of students who have received prizes or awards in previous years, but who are graduating in 1986, are also listed.
PRIZES AND AWARDS — Continued

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.
1986  Randy D. Brown, junior; Pamela C. Feldman, junior
1985  Johannes P. Schmidt*

DEANS’ CUP AND MASTERS’ CUP
Two awards, selected by the Deans and Masters, respectively, presented to graduating seniors 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.
Joy Kimi Watanabe, Deans’ Cup
Edward Nabeel George, Masters’ 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.
Recipient to be announced at Commencement.

HAREN LEE FISHER MEMORIAL AWARD IN JUNIOR PHYSICS
Awarded to a junior physics major who demonstrates the greatest promise of future contributions in physics.
1986  Randall D. Kamien
1985  Taylor W. Lawrence*

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.
1986  David E. Long, junior
1985  Myles A. Sussman*

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.
1986  Peter Leslie Cho
1985  James T. Liu*

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.
1986  Everett William Howe, senior
1985  John T. Fourkas*
PRIZES AND AWARDS — Continued

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.
1986 Susannah Joy Hannaford, junior
1985 Robin K. Wilson

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.
Derrick H. Nguyen

THE HERBERT NEWBY McCoy AWARD
Awarded to chemistry doctoral students for outstanding contributions to the science of chemistry.
Gregory A. Voth

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.
Timothy P. Allen, junior; Joseph Francis, junior

ROBERT L. NOLAND LEADERSHIP SCHOLARSHIP
Awarded to students who exhibit qualities of outstanding leadership, which is most often expressed as personal actions that have helped other people and that have inspired others to fulfill their capabilities.
1986 Peter D. Ashcroft, senior; Frank E. Kragh, senior
1985 Tammy L. Choy

THE RODMAN W. PAUL PRIZE
Awarded to a senior who has displayed unusual interest in and talent for history.
Paul G. Gillespie

THE ROYAL SOCIETY FOR THE ENCOURAGEMENT OF ARTS MANUFACTURES AND COMMERCE SILVER MEDAL
Awarded to students who are receiving their first degrees from the most important institutions of learning in the United States. Winners are selected on the basis of outstanding academic records and significant participation in student activities.
Myles Andrew Sussman

HERBERT J. RYSER MEMORIAL SCHOLARSHIPS
Awarded to undergraduate students for academic excellence, preferably in mathematics.
Eric Babson, sophomore; John Simpson, junior
PRIZES AND AWARDS — Continued

THE 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.

*Peter David Washbaugh*

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.

1986 James F. Bell, junior; Keith J. Owens, sophomore;
Robert W. Soderbery, sophomore

1985 Brian D. Metscher*

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

*Salman Mitha*

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.

1985 Roger W. Romani

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

*Eric Babson, sophomore*