



Ninetieth
Annual Commencement
June 8, 1984

CALIFORNIA INSTITUTE OF TECHNOLOGY

Ninetieth
Annual
Commencement

FRIDAY MORNING AT TEN O'CLOCK
JUNE EIGHTH, NINETEEN EIGHTY-FOUR

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
Secretary of the Faculty

Academic Procession

Chief Marshal, J. Kent Clark, Ph.D.

Assistant Marshals

Arden L. Albee, Ph.D.

Jenijoy La Belle, Ph.D.

Christopher E. Brennen, Ph.D.

Robert W. Oliver, Ph.D.

Faculty Officers

Charles D. Babcock, Ph.D.

Donald S. Cohen, Ph.D.

David C. Elliot, 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 R. Stanton Avery, LL.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 Cynthia Seagal Samuel
Director
Family Ministry Project
The Episcopal Diocese of Los Angeles

COMMENCEMENT ADDRESS Thomas J. Watson, Jr.
Chairman Emeritus
International Business Machines Corporation
Life Trustee, California Institute of Technology

MUSICAL SELECTION The Caltech Glee Clubs
Donald G. Caldwell, D.M.A., Conductor

"Hallelujah" from *Messiah*
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 . . . David B. Wales, 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 James J. Morgan, Ph.D.
Acting Dean of Graduate Studies

For the Degree of Doctor of Philosophy Dean Morgan

Biology Charles J. Brokaw, Ph.D.
Associate Division Chairman

Chemistry and Chemical Engineering . . . Harry B. Gray, Ph.D.
Division Chairman

Engineering and Applied Science . . . Roy W. Gould, 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 Reverend Samuel

RECESSIONAL . . . The Caltech Wind Ensemble Brass and Organ

ORGAN POSTLUDE Leslie Deutsch

Candidates for Degrees

BACHELOR OF SCIENCE

- Michael Ammon *Salyer, California* Engineering and Applied Science
Stephen C. Anco *Toronto, Ontario, Canada* Physics
Glyn Harold Anderson *Cypress, California* Engineering and Applied Science
Robert Christopher Anderson III *Torrance, California* Engineering and Applied Science
Bradley Michael Axan *Sepulveda, California* Physics
Gregory Paul Bala *Novato, California* Applied Mathematics
Clinton Lee Ballard *Seattle, Washington* Mathematics
Kaushik Banerjee *Calcutta, India* Electrical Engineering
Terence David Barr *Houston, Texas* Geophysics
Ramanuj Basu *Warminster, Pennsylvania* Biology
Steven Michael Baxter *Canyon Country, California* Chemistry
James Horatio Bell *El Paso, Texas* Engineering and Applied Science
Mignon Lisette Belongie *Sacramento, California* Electrical Engineering
Connie S. Bennit *Ogden, Utah* Chemical Engineering
Paul Gordon Berglund *Danbury, Connecticut* Mathematics
Theresa Renee Birdseye *Long Beach, California* Chemical Engineering
Daniela Maria Clara Bonafede *Valenza Po, Italy* Biology
Alex K. Bouzari *Paris, France* Engineering and Applied Science and Economics
Kirk Eugene Brattkus *Hope, Idaho* Applied Mathematics
Duke Pierre Briscoe *Athens, Georgia* Engineering and Applied Science
Bradley Wayne Brock *Louisville, Kentucky* Physics and Applied Mathematics
Carol Jacqueline Bryan *Annandale, Virginia* Chemistry
Chris John Burak *La Mesa, California* Applied Physics
Jerry Robert Burch *Orange, California* Engineering and Applied Science
Joseph Ken Burfoot *Anaheim Hills, California* Engineering and Applied Science
Reed McClellan Burkhart *Red Bluff, California* Electrical Engineering and Mathematics
John L. Byrne *Santa Ynez, California* Engineering and Applied Science
Daren James Casey *San Gabriel, California* Engineering and Applied Science
Chung Lau Chan *Hong Kong* Engineering and Applied Science
Joe Chung-yee Chang *Deerfield, Massachusetts* Physics
John H. Chang *Austin, Texas* Electrical Engineering
David Anthony Chavez *Pasadena, California* Electrical Engineering

Students whose names appear in boldface type are being graduated with honor in accordance with a vote of the faculty.

BACHELOR OF SCIENCE — *Continued*

- Howard Ze Hua Chen** *Beijing, China* Applied Physics
- Pang-Chieh Chen** *Wichita Falls, Texas* Applied Mathematics and Engineering and Applied Science
- Howard T. Chiang *Bayside, New York* Electrical Engineering
- David W. Childs *Englewood, Colorado* Engineering and Applied Science
- Mark Scott Chittjian *Monterey Park, California* Engineering and Applied Science
- Charlotte Barbara Clark** *Gaithersburg, Maryland* Engineering and Applied Science
- Jeffrey A. Clayhold** *Kennewick, Washington* Physics
- Thaddeus J. Conneally** *Lombard, Illinois* Chemical Engineering
- Joannes Mario Costa** *Rialto, California* Applied Physics and Applied Mathematics
- Evan Francis Cromwell** *Ballwin, Missouri* Chemistry
- Charles John Cuny** *Sacramento, California* Mathematics and Economics
- Geoffrey Tsuneo Dairiki** *Berkeley, California* Electrical Engineering
- Daniel Cornelius Davis** *Sioux Falls, South Dakota* Biology
- Joseph E. Decker, Jr. *Castro Valley, California* Mathematics
- James Taylor Determan *San Marino, California* Engineering and Applied Science
- James Lincoln DeWitt *Port Huron, Michigan* Physics
- Paul A. Diffendaffer *Boise, Idaho* Engineering and Applied Science
- J. Emmanuel Mercado Disini *Manila, Philippines* Electrical Engineering
- Michael Maurice Doty *Houston, Texas* Engineering and Applied Science
- Hendrik Matthew Duiker *Oklahoma City, Oklahoma* Electrical Engineering
- Michael Alexander Enescu *Gardena, California* Engineering and Applied Science
- John Edward Eng** *San Francisco, California* Electrical Engineering
- Richard Henry Erving II *Tarzana, California* Electrical Engineering
- Melissa Ann Farrell *Sitka, Alaska* Engineering and Applied Science
- Reese Earl Faucette** *Huntsville, Alabama* Engineering and Applied Science
- Erik Jaime Fernandez *Midland, Michigan* Chemical Engineering
- Michael Anthony Fernandez *Oak Park, Illinois* Applied Physics
- David James Fink *Redlands, California* Engineering and Applied Science
- John Kai Fong *San Francisco, California* Physics
- Roger Ben Fong *Los Angeles, California* Electrical Engineering
- Donald James Fossgreen *Elk Grove, California* Engineering and Applied Science
- Lucinda Joy France *Alliance, Ohio* Electrical Engineering
- Josef Frisch** *Elizabeth, New Jersey* Physics
- David Roy Fun *San Francisco, California* Engineering and Applied Science
- Tracy Takashi Furutani** *Sun Valley, California* Chemistry and History
- Stuart Elgin Goodnick *Littleton, Colorado* Physics
- Scott Wallace Gordon-Wylie *Wollongong, N.S.W., Australia* Chemistry and Biology
- Raymond Joseph Gralak *Toledo, Ohio* Electrical Engineering

BACHELOR OF SCIENCE—Continued

- Eric Ralph Grannan** *Riverside, California* Physics
Peter Jonathan Grieve *Logan, Utah* Physics
Vance Richard Haemmerle *San Diego, California* Astronomy
Mehrdad Haghi *Shiraz, Iran* Applied Physics and Engineering and Applied Science
Patrick James Harrison *Ephrata, Washington* Electrical Engineering
Kirk Raymond Haselton *Tustin, California* Applied Physics
Roy Tadashi Hashimoto *Florence, Alabama* Electrical Engineering
David Warren Hawley *Fallbrook, California* Electrical Engineering
David Christopher Hayes *Los Angeles, California* Engineering and Applied Science
Thomas Ewald Heer *La Cañada, California* Biology
Alix K. Herrmann *Richmond, California* Engineering and Applied Science
Jeffrey Morrison Hicks *Scotch Plains, New Jersey* Applied Physics
Elliot Brooks Hohri *Long Beach, California* Electrical Engineering
Mark Robert Holst *Irvine, California* Chemical Engineering
Keith Alan Holt *Brea, California* Electrical Engineering
Richard Edward Honrath, Jr. *Sacramento, California* Engineering and Applied Science
John Bryan Howley *Colorado Springs, Colorado* Applied Physics
Kenneth Hui *Brookline, Massachusetts* Physics
Cecile B. Huling *Simi Valley, California* Engineering and Applied Science
Hiram Morris Hunt *Las Vegas, Nevada* Electrical Engineering
Masahiko Inui *Nara-shi, Japan* Physics
Stephen Edward Jones *Riverside, California* Physics
Kirk George Kanzelberger *Manitowoc, Wisconsin* Biology
Karim Fahmi Karagulla *Beirut, Lebanon* Engineering and Applied Science
George Nicholas Karas *Panama City Beach, Florida* Engineering and Applied Science
Morris Joel Katz *Los Angeles, California* Engineering and Applied Science
Gregory Theodosios Kavounas *Athens, Greece* Electrical Engineering
Ali Kazeroonian *Tehran, Iran* Physics
Robert Emmett Kelly, Jr. *Pasadena, California* Engineering and Applied Science
Asad Khan *Karachi, Pakistan* Electrical Engineering and Economics
Takashi Kimura *South Portland, Maine* Physics
Irwin Kuo-Chin King *Taipei, Taiwan* Engineering and Applied Science
John Edward Krehbiel *El Cajon, California* Engineering and Applied Science
Siu-Ling L. Ku *San Francisco, California* Engineering and Applied Science
Thomas Kupiszewski *Passaic, New Jersey* Engineering and Applied Science
Tak Leuk David Kwok *Hong Kong* Physics
Brian Lau Kwan Fong Lau *Honolulu, Hawaii* Applied Mathematics
Joseph Kai-Tung Lee *Anaheim, California* Chemical Engineering

BACHELOR OF SCIENCE — *Continued*

David Louis Levine *Pasadena, California* Engineering and Applied Science
Wuwell Liao *Alhambra, California* Physics and Applied Mathematics
Yung Chan Lim *Seoul, Korea* Electrical Engineering
Mark David Lindsay *Denver, Colorado* Physics
Ray Lischner *Cherry Hill, New Jersey* Engineering and Applied Science
Faan Tone Liu *Arlington Heights, Illinois* Engineering and Applied Science
Gino Ko Maa *Huntington Beach, California* Electrical Engineering
Timothy Michael Magee *Tucson, Arizona* Electrical Engineering
John Mark Mahony *Alton, Illinois* Mathematics
Alan Yu-Lai Mak *Hong Kong* Applied Physics
Evan M. Manning *Miami, Florida* Applied Physics
Gail Anne Manning *Wadsworth, Ohio* Engineering and Applied Science
Moses Mares *El Paso, Texas* Chemical Engineering
Mark Scott Marley *Phoenix, Arizona* Geophysics
John Bradley Marston *Los Altos, California* Physics
Stephen Patrick Martin *Salinas, California* Physics
David L. Marvit *Swampscott, Massachusetts* Biology
Deborah Lynn Mathews *Evergreen, Colorado* Engineering and Applied Science
James Russell Mayhew *St. Louis, Missouri* Applied Physics
Candice McCoy *Salt Lake City, Utah* Biology
Brian Tappan McLain *Burlingame, California* Physics
Donald Laurence Meixner *Sacramento, California* Chemical Engineering
James Raymond Merino *Diamond Bar, California* Applied Mathematics
Niels Erik Wadum Michelsen *Bakersfield, California* Electrical Engineering
Edward William Miles *Oxnard, California* Applied Physics
Craig Newton Minor *Everett, Washington* Engineering and Applied Science
Robert Bryson Murphy *Tucson, Arizona* Chemical Engineering
Alan Glenn Murray *Santa Ana, California* Physics and Applied Mathematics
Tarik Naheiri *Casablanca, Morocco* Chemical Engineering
Elizabeth Anne Newman *San Diego, California* Chemical Engineering
Phu Thien Nguyen *Los Angeles, California* Chemical Engineering
Lisa Anne Nikodym *San Diego, California* Engineering and Applied Science
Joseph R. O'Donnell *Dayton, Ohio* Engineering and Applied Science
Harold Sekum Ofori *Accra, Ghana* Electrical Engineering
Sverrir 'Olafsson *Reykjavik, Iceland* Electrical Engineering
Michael Ray Oliver *Los Altos, California* Mathematics
Scott Nelson Paine *Tarzana, California* Applied Physics
Eric Ting-Shan Pan *Fremont, California* Applied Physics

BACHELOR OF SCIENCE—Continued

- Carlotta Marie Paulsen** *Gaithersburg, Maryland* Chemistry
Stewart Anthony Peebles *Sunnyvale, California* Applied Mathematics
Ronald Emmanuel Pekar *Long Beach, California* Engineering and Applied Science
Richard Randolph Phillips *New York, New York* Applied Physics
George Herbert Pitt III *Ketchikan, Alaska* Mathematics
Norman Henry Princen *Peoria, Illinois* Engineering and Applied Science
Mark Richard Purtill *Bellingham, Washington* Mathematics
Thomas Wayne Remmers *Fairfax Station, Virginia* Chemical Engineering
Bruce A. Richman *Newport Beach, California* Physics
Steven Paul Riley *Blythe, California* Physics
Pedro Pablo Rodriguez *Bakersfield, California* Chemical Engineering
Suzanne Lyon Rosik *Gig Harbor, Washington* Engineering and Applied Science
Douglas Mark Ruden *Kettering, Ohio* Biology and Chemistry
David J. Sahnaw *Warwick, Rhode Island* Physics
John David Sahr *Selah, Washington* Electrical Engineering
John Joseph Schaeck *Diamond Bar, California* Chemistry
Robert Wayne Schaff *Long Beach, California* Independent Studies Program
Steve Gregory Schlipf *Pasadena, California* Engineering and Applied Science
Darrell Galen Schlom *Lemon Grove, California* Engineering and Applied Science
David Alan Schultz *Sepulveda, California* Economics
Kelley Ann Scott *San Diego, California* Engineering and Applied Science
Phillip Christopher Scott *Poway, California* Chemical Engineering
Paul Derry Shaffer *Salem, Oregon* Electrical Engineering
Kathleen Ruth Sheedy *Los Angeles, California* Engineering and Applied Science
Douglas James Shors *St. Charles, Missouri* Mathematics
Jen Shu *Los Angeles, California* Chemical Engineering
Peter C. Siracusa *Corpus Christi, Texas* Applied Mathematics
Martin Jay Sirkin *Sharon, Massachusetts* Engineering and Applied Science
Anthony Skjellum *San Marino, California* Physics
Jeremy Sinclair Sommer *Redondo Beach, California* Electrical Engineering
Alma Gregory Sorensen *South Pasadena, California* Biology
Clara Spalter Better *Montevideo, Uruguay* Chemical Engineering
Don Anthony Speck *Bourbon, Missouri* Engineering and Applied Science
Steven Mark Stahl *Abilene, Texas* Physics
Christian William Stassen *Newark, Ohio* Engineering and Applied Science
Clare Waterson Stassen *Fountain Valley, California* Engineering and Applied Science
Scott Adam Stephens *Banning, California* Applied Physics and Astronomy
Lee Scott Sunderlin *Federal Way, Washington* Chemistry

BACHELOR OF SCIENCE — *Continued*

- Edward Joseph Suranyi** *North Hollywood, California* Applied Physics
- Eliza Leeds Sutton** *Palo Alto, California* Chemistry
- Steven Roger Swanson *Clayton, Wisconsin* Astronomy
- Matthew J. Swass *South Orange, New Jersey* Engineering and Applied Science
- Janet Ayako Tamada** *Seattle, Washington* Chemical Engineering
- Mark David Tinkle *Anaheim, California* Physics
- Brian Scott Tipton** *Englewood, Ohio* Engineering and Applied Science
- Han Shih Toh *Singapore* Applied Mathematics
- Emre Toker *Istanbul, Turkey* Electrical Engineering
- George Serge Tolomiczenko** *Toronto, Ontario, Canada* Independent Studies Program
- Nadeem Tufail *Lahore, Pakistan* Chemical Engineering
- Barbara Jo Turpin *Federal Way, Washington* Engineering and Applied Science
- Michael Turyn *Lynbrook, New York* Physics
- Camilla Adèle Van Voorhees** *Larkspur, California* Biology
- Jesus Noel Samonte Villaseñor *Manila, Philippines* Physics
- Mark Roger Waggoner *Altamonte Springs, Florida* Physics
- Walter Michael Weber *Detroit, Michigan* Engineering and Applied Science
- Harold Mark Weiser *Brooklyn, New York* Physics
- Ted Eugene Williams** *Anaheim, California* Applied Physics and Engineering and Applied Science
- Laura Diane Wilson *San Mateo, California* Engineering and Applied Science
- Ned Scott Wingreen** *Studio City, California* Physics
- Kriengkrai Wisanrakkit** *Bangkok, Thailand* Chemical Engineering
- Peter W. Wong *Fresno, California* Physics
- Satoshi Yoshizawa** *Kawasaki, Japan* Applied Physics
- David Hart Zobel *Cohasset, Massachusetts* Engineering and Applied Science
- Denes L. Zsolnay *Pasadena, California* Engineering and Applied Science

MASTER OF SCIENCE

- Flavio Filomeno Acosta Cano de Los Rios (*Electrical Engineering*) Ingeniero Industrial en Electronica, Instituto Tecnologico de Chihuahua 1982.
- Theodore John Allen (*Physics*) B.S., University of Wisconsin-Madison 1982.
- Steven Mark Anlage (*Applied Physics*) B.S., Rensselaer Polytechnic Institute 1982.
- Norbert Karl Erhard Arndt (*Mechanical Engineering*) Diplomvorprüfung, Rheinisch-Westfälische Technische Hochschule Aachen 1982.
- Deidre Ann Askew (*Chemistry*) B.S., North Dakota State University 1982.
- Miguel Jorge Bagajewicz (*Chemical Engineering*) Ingeniero Químico, Universidad Nacional del Litoral 1977.
- Roger Curtis Bales (*Social Science*) B.S., Purdue University 1974; M.S., University of California, Berkeley 1975.
- Jeffrey Scot Banks (*Social Science*) B.A., University of California, Los Angeles 1982.
- Mary Anne Barsony (*Physics*) B.A., University of California, Berkeley 1976; S.B., Massachusetts Institute of Technology 1982.
- Sassan Bassiri (*Electrical Engineering*) B.S., South Dakota State University 1983.
- Gary R. Becker (*Mathematics*) B.S., B.A., Texas Lutheran College 1979.
- Gregorio Beitman (*Electrical Engineering*) Licenciatura en Ingeniería Electronica, Universidad Autonoma Metropolitana 1983.
- Jeffrey Brian Berner (*Electrical Engineering*) B.S., California Institute of Technology 1983.
- Johan Lambert Bijmens (*Physics*) Licentiaat, Katholieke Universiteit Leuven 1982.
- Paul Sylvain Bloch (*Electrical Engineering*) Diplôme d'Ingénieur, Ecole Nationale Supérieure des Télécommunications 1984.
- Anne-Marie Brest (*Electrical Engineering*) Diplôme d'Ingénieur, Ecole Supérieure d'Ingénieurs en Electronique et Electrotechnique 1983.
- Bradley Wayne Brock (*Mathematics*) B.S., California Institute of Technology 1984.
- Melinda Mary Brugman (*Geology*) B.S., University of Washington 1978.
- Ronald William Burch (*Electrical Engineering*) B.S., California State University, Fresno 1982.
- Hong-Man Chan (*Chemical Engineering*) B.E., The Cooper Union 1981.
- Pang-Chieh Chen (*Engineering Science*) B.S., California Institute of Technology 1984.
- Wen-Chi Chen (*Computer Science*) B.S., National Taiwan University 1978; M.S., 1980.
- Chao-lin Chiang (*Computer Science*) B.S., National Taiwan University 1978; M.S., University of Southern California 1981.
- David Nelson Chiang (*Chemical Engineering*) B.S., Purdue University 1982.
- Chi-Bin Chien (*Physics*) B.A., Johns Hopkins University 1981.
- Marcus Paul Chown (*Astronomy*) B.Sc., Queen Mary College, University of London 1980.

MASTER OF SCIENCE — *Continued*

- Loucas Nicou Christodoulides (*Electrical Engineering*) B.S., Polytechnic Institute of New York 1983.
- Haris Christodoulou (*Physics*) B.Sc., Imperial College of Science and Technology, University of London 1983.
- Yam Ki Chu (*Physics*) B.S., Cornell University 1973.
- Gary W. Clow (*Electrical Engineering*) B.A.S., Florida Atlantic University 1978; M.A.S., 1979.
- Thomas Francis Conneally (*Mechanical Engineering*) B.S., University of Illinois at Urbana-Champaign 1983.
- Charles John Cuny (*Social Science*) B.S., California Institute of Technology 1984.
- Howard Derby (*Computer Science*) B.S., California Institute of Technology 1982.
- James M. Devitt (*Electrical Engineering*) B.E., University College, Dublin 1983.
- Judy Lynne Dillenbeck (*Mechanical Engineering*) B.A., Houghton College 1983.
- Christopher Joseph Diorio (*Electrical Engineering*) B.A., Occidental College 1983.
- Yurdaer Nezihi Doganata (*Electrical Engineering*) B.S., Middle East Technical University 1981; M.S., 1983.
- Michael John Dowling (*Civil Engineering*) B.E., National University of Ireland 1980.
- Pascale Claude Dubois (*Aeronautics*) Diplôme d'Ingénieur, Ecole Nationale Supérieure d'Ingénieurs de Constructions Aéronautiques 1983.
- Christos Efstathiou (*Physics*) B.Sc., Imperial College of Science and Technology, University of London 1982.
- David John Farina (*Electrical Engineering*) B.S.E.E., University of Pennsylvania 1981.
- Thomas John Fleming (*Mechanical Engineering*) B.S., University of Rochester 1983.
- Janet Elizabeth Freeman (*Aeronautics*) S.B., Massachusetts Institute of Technology 1978.
- Benjamin Frisch (*Geochemistry*) B.S., Haverford College 1982.
- Farid Gasmi (*Social Science*) Licence en Sciences Economiques, Université D'Alger 1981.
- Miles Jacob Gehm, Jr. (*Chemical Engineering*) B.S., Carnegie-Mellon University 1981.
- Jurgen Johannes Giezen (*Aeronautics*) B.S., State University of New York at Buffalo 1983.
- Koichi Gotoh (*Electrical Engineering*) B.A., Tokyo Institute of Technology 1978.
- Jon Eric Grove (*Physics*) A.B., University of California, Berkeley 1982.
- Roch Guérin (*Electrical Engineering*) Diplôme d'Ingénieur, Ecole Nationale Supérieure des Télécommunications 1983.
- Armen Hairapetian (*Electrical Engineering*) B.S., University of California, Irvine 1982.
- Neal Handly (*Chemistry*) B.S., California State University, San Jose 1974; M.Sc., University of Oxford 1977.

MASTER OF SCIENCE — Continued

- Orkun Hasekioglu (*Electrical Engineering*) B.S., Polytechnic Institute of New York 1984.
- Takao Hayashi (*Electrical Engineering*) B.E., Tokyo Institute of Technology 1976; M.E., 1978.
- Jacques Charles Hebert (*Electrical Engineering*) Licence d'économie appliquée, Université Paris-Dauphine 1983; Diplôme d'Ingénieur, Ecole Centrale de Paris 1984.
- Joan Marie Heil (*Mechanical Engineering*) B.S.M.E., Michigan Technological University 1983.
- Larry Glenn Hill (*Aeronautics*) B.S.Ac.E., University of Michigan 1983.
- David Hans Hough (*Astronomy*) B.A., University of Pennsylvania 1980.
- Heidi Beth Houston (*Geophysics*) B.S., University of Washington 1978; M.S., University of Wisconsin-Madison 1979.
- Chih-Chieh Hu (*Electrical Engineering*) B.S., Polytechnic Institute of New York 1983.
- Paramsothy Jayakumar (*Civil Engineering*) B.Sc., University of Peradeniya 1982.
- Matthew Bruce Johnson (*Physics*) B.Sc., University of Waterloo 1979.
- Todd Jarrott Jones (*Applied Physics*) B.S., Harvey Mudd College 1981.
- George Kailiwai III (*Electrical Engineering*) B.S.E.E., United States Air Force Academy 1978; M.B.A., Golden Gate University 1980; M.P.A. 1981.
- James M. Kaufman (*Physics*) A.B., University of California, Berkeley 1982.
- Kazunori Kawasaki (*Aeronautics*) B.S., Kyoto University 1976.
- Sung Joon Kim (*Electrical Engineering*) B.S., California Institute of Technology 1983.
- Randolph Livingstone Kirk (*Planetary Science*) B.S., Stanford University 1981.
- George Michael Klapakis (*Electrical Engineering*) B.E., Manhattan College 1981.
- Sridhar Krishnaswamy (*Aeronautics*) B.Tech., Indian Institute of Technology, Madras 1983.
- Charles E. Lane (*Physics*) B.S., Indiana University at Bloomington 1981.
- Claude Lauzon (*Aeronautics*) Bachelier en Ingénierie, Ecole Polytechnique de Montréal 1983.
- Anthony Trung Le (*Chemistry*) B.A., University of California, Santa Cruz 1981.
- Francoise Jacqueline LeMouel (*Electrical Engineering*) Diplôme d'Ingénieur, Ecole Centrale de Lyon 1983.
- Julia Catherine Lester (*Chemical Engineering*) B.S., Purdue University 1981.
- Da-Hsiang Donald Lien (*Social Science*) B.S., National Tsing-Hua University 1975; M.S., National Chiao-Tung University 1979.
- Timothy Francis Lindsey (*Applied Physics*) B.S., University of California, Berkeley 1981.
- Davy YiChin Lo (*Physics*) B.S., University of California, Irvine 1982.
- Thomas Dudley Looke, Jr. (*Electrical Engineering*) B.S.S.E., United States Naval Academy 1983.

MASTER OF SCIENCE — *Continued*

- Christopher Paul Lutz (*Computer Science*) B.S., California Institute of Technology 1981.
- Raghu Madhavan (*Applied Mechanics*) B.Tech., Indian Institute of Technology, Madras 1983.
- Kiet Anh Mai (*Electrical Engineering*) B.S., University of Hawaii at Manoa 1980.
- Mark Warner Maier (*Electrical Engineering*) B.S., California Institute of Technology 1983.
- Jon Mearns McChesney (*Applied Physics*) B.Sc., University of Natal 1978; B.Sc. (Honours), 1979; M.Sc., 1983.
- Dawn Christine Meredith (*Physics*) B.A., St. John's College 1980.
- Roy Yoshio Myose (*Aeronautics*) B.S., University of Southern California 1983.
- Bruno Charles Nadd (*Electrical Engineering*) Diplôme d'Ingénieur, Ecole Centrale de Lyon 1983.
- Kit Yin Ng (*Environmental Engineering Science*) B.Sc., University of Hong Kong 1983.
- John Yee-Keung Ngai (*Computer Science*) B.S., California Institute of Technology 1982.
- Shouleh Nikzad (*Electrical Engineering*) B.S., University of Southern California 1982.
- Mats Gunnar Nordahl (*Physics*) Civ. ing., Royal Institute of Technology 1980.
- Nonkululeko Nyembezi (*Electrical Engineering*) B.Sc., University of Manchester Institute of Science and Technology 1983.
- Mark David Olson (*Physics*) B.S., University of Washington 1981.
- Peter Orr (*Mechanical Engineering*) B.A., Whitman College 1983; B.S., California Institute of Technology 1983.
- Yen-Jen Oyang (*Computer Science*) B.S., National Taiwan University 1982.
- David Alan Pickett (*Geology*) B.A., Rice University 1982.
- Christodoulos Pilinis (*Environmental Engineering Science*) B.Sc., The National Technical University of Athens 1983.
- Cathy Jean Ploszaj (*Civil Engineering*) B.S., University of Connecticut 1983.
- Carol Ann Polanskey (*Geophysics*) B.S., The Pennsylvania State University 1982.
- Michael Roland Prairie (*Chemical Engineering*) B.S., University of New Mexico 1982.
- Aluizio Prata Jr. (*Electrical Engineering*) Engenheiro Eletricista (Eletrônica), Universidade de Brasília 1976; Mestre em Engenharia Elétrica, Pontifícia Universidade Católica do Rio de Janeiro 1982.
- Carol Seabury Prentice (*Geology*) B.A., Humboldt State University 1979.
- Jeffrey David Pugh (*Aeronautics*) B.E., University of Auckland 1982.
- Guillermo Pablo Pulos Cárdenas (*Aeronautics*) B.S., California Institute of Technology 1982.

MASTER OF SCIENCE — *Continued*

- Nadaradjane Ramat (*Electrical Engineering*) Diplôme d'Ingénieur, Ecole Nationale Supérieure des Télécommunications de Bretagne 1983.
- Taje-Indralall Ramsamujh (*Mathematics*) B.Sc., Imperial College of Science and Technology, University of London 1982.
- Wade Gordon Regehr (*Applied Physics*) B.Sc., University of Regina 1982.
- Jeffrey Patrick Rhinesmith (*Electrical Engineering*) B.S., California State University, Sacramento 1973.
- Syed Azhar Abbas Rizvi (*Electrical Engineering*) B.S., Shiraz University 1982.
- Hélio Teixeira Rodrigues (*Electrical Engineering*) Electronics Technician, Colégio Técnico Industrial 1977; Engenharia Eletrica, Fundação Educacional de Bauru 1982.
- Phoebus Rosakis (*Applied Mechanics*) B.Sc., Brown University 1983.
- Donald James Rudy (*Planetary Science*) B.S., Marquette University 1979; M.S., University of Wisconsin-Madison 1981.
- Thomas Gerard Rummelhart (*Electrical Engineering*) B.S.E.E., The University of Iowa 1983.
- Nadira Behlilovic Sabanovic (*Electrical Engineering*) Diplôme d'Ingénieur, University of Sarajevo 1972.
- Ranajit Sahu (*Mechanical Engineering*) B.Tech., Indian Institute of Technology, Kharagpur 1983.
- Douglas Ray Schmitt (*Geophysics*) B.Sc., University of Lethbridge 1980.
- Steven Philip Schneider (*Aeronautics*) B.S., California Institute of Technology 1981.
- Michael David Schuster (*Computer Science*) B.A., University of California, San Diego 1977.
- Kurt Eric Seel (*Geology*) B.A., University of Montana 1982.
- Lynn Alison Silver (*Geology*) A.B., University of California, Berkeley 1981.
- Gregory Todd Smedley (*Aeronautics*) B.Sc., University of Alberta 1983.
- Clive Leonard Smith (*Electrical Engineering*) B.Sc., University of the Witwatersrand 1980.
- Israel Soibelman (*Mechanical Engineering*) B.S., Columbia University 1983.
- Aditya Srinivasan (*Electrical Engineering*) B.S., California Institute of Technology 1983.
- Christopher Herschel Starr (*Physics*) B.A., Columbia University 1982.
- James David Sterling (*Mechanical Engineering*) B.S., Texas A&M University 1983.
- Howard David L. Stone (*Physics*) B.A., Lincoln College, University of Oxford 1982.
- Steven Rolf Strand (*Chemical Engineering*) B.Ch.E., University of Minnesota, Institute of Technology 1982.
- Wen-King Su (*Computer Science*) B.S., University of California, Davis 1982.
- Chick Kee Jackie Tang (*Electrical Engineering*) B.A., University of California, San Diego 1983.

MASTER OF SCIENCE — *Continued*

- Daniel Albert Tazartes (*Electrical Engineering*) B.S., University of California, Los Angeles 1983.
- James M. Trosino (*Electrical Engineering*) B.S., Drexel University 1983.
- Wilman Tsai (*Chemical Engineering*) B.Sc., Syracuse University 1982.
- Steve Ronald Turner (*Chemistry*) B.S., University of California, Los Angeles 1981.
- Richard Peter Edward Tymerski (*Electrical Engineering*) B.Sc., The University of New South Wales 1977; B.E., 1980; M.Eng.Sc., 1983.
- Robert Bruce Vogelaar (*Physics*) B.S., Hope College 1982.
- Andrew Lyndon Waite (*Environmental Engineering Science*) B.Sc., D.I.S., Loughborough University of Technology 1983.
- John Y. Wang (*Electrical Engineering*) B.S., California Institute of Technology 1983.
- Peter David Washabaugh (*Aeronautics*) B.S., University of Michigan 1983.
- Walter Michael Weber (*Applied Physics*) B.S., California Institute of Technology 1984.
- Robert G. Whirley (*Applied Mechanics*) B.M.E., Georgia Institute of Technology 1983.
- Timothy Lowell Williams (*Electrical Engineering*) B.S., California Institute of Technology 1983.
- Brian Alan Wong (*Environmental Engineering Science*) B.S., Harvey Mudd College 1974.
- Herman A. Yee (*Chemical Engineering*) B.S., Wayne State University 1982.
- Xian-Li Yeh (*Applied Physics*) B.S., California Institute of Technology 1982.
- Jeffrey Winston Yu (*Electrical Engineering*) B.S., California Institute of Technology 1983.

ENGINEER

- Samuel Kwang-Yeh Chang (*Aeronautical Engineer*) B.Sc., National Taiwan Normal University 1976; M.S., California Institute of Technology 1980.
- Christopher Sy Lim (*Aeronautical Engineer*) B.S., Rensselaer Polytechnic Institute 1981; M.S., California Institute of Technology 1982.

DOCTOR OF PHILOSOPHY

DIVISION OF BIOLOGY

Alice Mary Cronin-Golomb (*Psychobiology*) B.A., Wesleyan University 1979.

Thesis: Intrahemispheric Processing and Subcortical Transfer of Non-verbal Information in Subjects with Complete Forebrain Commissurotomy.

Thomas Edward Crowley (*Biology*) B.S., University of Illinois at Urbana-Champaign 1979.

Thesis: Functions and Regulation of RNAs Transcribed from the *Drosophila melanogaster* 68C Puff.

Ruth Anne Eatock (*Biology*) B.Sc., McGill University 1976; M.Sc., 1978.

Thesis: Sensory Adaptation in Hair Cells of the Bullfrog's Sacculus.

David Alan Goldberg (*Biochemistry*) B.S., Yale University 1976.

Thesis: Molecular Studies on the Alcohol Dehydrogenase Gene of *Drosophila melanogaster*.

Herman Gordon (*Biology*) A.B., Harvard College 1978.

Thesis: Postnatal Development of Motor Units in Rabbit and Rat Soleus Muscles.

Lawrence Charles Katz (*Neurobiology*) B.A., University of Chicago 1979.

Thesis: Intrinsic Connectivity of Identified Projection Neurons in Cat Visual Cortex Brain Slices.

Mauri Eugene Krouse (*Neurobiology*) B.S., Rensselaer Polytechnic Institute 1976.

Thesis: Investigation of Competitive Antagonist Binding to the Nicotinic Acetylcholine Receptor Using Voltage-jump and Light-flash Techniques.

Jeffrey Terrell Mayne (*Biochemistry*) S.B., Massachusetts Institute of Technology 1974.

Thesis: The Post-translational Processing of Sindbis Virus Glycoproteins.

Jay J. Myers (*Psychobiology and Computer Science*) B.A., Claremont Men's College 1977; M.A., California State College, San Bernardino 1979.

Thesis: Cognitive Transfer from the Right to Left Hemisphere after Section of the Forebrain Commissures.

DIVISION OF CHEMISTRY AND CHEMICAL ENGINEERING

Jay Douglas Audett (*Chemistry*) B.S., University of Connecticut 1978.

Thesis: (2,2-Dimethylcyclopropyl)carbonyl Grignard Reagents and the Reactivity of Osmium Tetraoxide and Peroxycarboxylic Acids with Low Valent Iridium Compounds.

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

DOCTOR OF PHILOSOPHY — *Continued*

- Uptal Banerjee (*Chemistry*) B.Sc., St. Stephen's College, Delhi University 1977;
M.Sc., Indian Institute of Technology, Kanpur 1979.
Thesis: Alamethicin: Secondary Structure in Solution and Interactions with
Phospholipid Membranes.
- Javier Bartroli (*Chemistry*) Licenciatura en Químicas, University of Barcelona 1979.
Thesis: Stereospecific Aldol Condensations Via Boron Enolates. The Syntheses of
(+)-Prelog-Djerassi Lactone and (+)-Tylenolide.
- Mark Elliott Bassett (*Chemical Engineering and Applied Mathematics*) B.S.E.,
Princeton University 1978.
Thesis: Mathematical Modeling of Atmospheric Aerosol Equilibria and Dynamics.
- Donald H. Berry (*Chemistry*) S.B., Massachusetts Institute of Technology 1978.
Thesis: Studies of the Reactivity of Permethylzirconocene Complexes with Binuclear
Transition Metal Carbonyl Compounds.
- David Edward Brinza (*Chemistry*) B.S., Illinois State University 1977.
Thesis: I. Millimeter Microwave Spectroscopy of Radicals. II. Laser Spectroscopy of
the van der Waals Molecule Ne-Cl₂.
- Daniel Alan Buttry (*Chemistry*) B.A., University of Colorado, Colorado Springs
1979.
Thesis: Effects of Electron Exchange on Photochemical, Electrochemical, and
Electrocatalytic Responses of Polymer Modified Electrodes.
- Michael Paul Casassa (*Chemistry*) B.S., University of Pittsburgh 1978.
Thesis: Infrared Photodissociation of van der Waals Molecules.
- Douglas S. Clark (*Chemical Engineering*) B.S., University of Vermont 1979.
Thesis: Molecular Level Investigations and Mathematical Modeling of Immobilized
 α -Chymotrypsin Preparation, Utilization and Deactivation.
- Nancy Marie Doherty (*Chemistry*) B.A., Dartmouth College 1979.
Thesis: Reversible Insertion of Olefins and Alkynes into Transition Metal Hydride
Bonds.
- Richard Raymond Durand Jr. (*Chemistry*) B.S., Worcester Polytechnic Institute
1979.
Thesis: Catalysis of the Electroreduction of Dioxygen by Monomeric and Dimeric
Cobalt Porphyrins.
- Brian Joseph Fitzsimmons (*Chemistry*) B.Sc., University of Waterloo 1977; M.Sc.,
1979.
Thesis: The Total Synthesis of the Enantiomer of Lasalocid A.
- Jorge Soto Gonzalez (*Chemistry*) B.S., Instituto Tecnológico y de Estudios Superiores
de Monterrey 1976.
Thesis: Mechanistic Aspects of the Ziegler-Natta Polymerization.
- Marvin Mark Goodgame (*Chemistry*) B.S., Louisiana Technical University 1975.
Thesis: Exchange Forces in Transition-Metal Bonding.

DOCTOR OF PHILOSOPHY — *Continued*

- Murray Ross Gray (*Chemical Engineering*) B.A.Sc., University of Toronto 1978;
M. Eng., University of Calgary 1980.
Thesis: The Effects of Moisture and Ash Content on the Pyrolysis of a Wood Derived Material.
- Cigdem Gurer (*Chemical Engineering*) S.B., Massachusetts Institute of Technology 1979.
Thesis: Time Dependent and Equilibrium Stress-Strain Behavior of Rubbers in Moderately Large Deformations.
- Daniel Dale Hanle (*Chemical Engineering*) B.S., University of South Carolina 1978.
Thesis: In Vitro Fluid Dynamics of Prosthetic Aortic Heart Valves in Steady and Pulsatile Flow.
- Robert P. Hertzberg (*Chemistry*) B.A., Wayne State University 1977.
Thesis: Cleavage of DNA with Methidiumpropyl-EDTA.
- Richard Alan Ikeda (*Chemistry*) B.S., University of California, Berkeley 1979.
Thesis: I. Bismethidium Intercalators: The Binding of Nucleic Acids. II. Experiments in the Design of Site Specific DNA Cleaving Agents.
- Robert James Kaiser, Jr. (*Chemistry*) B.S., Kenyon College 1976.
Thesis: Nuclear Magnetic Resonance and Kinetic Studies of the Catalytic Mechanism of the Serine Proteases.
- Rohit Khanna (*Chemical Engineering*) B.S., Purdue University 1979.
Thesis: Control Model Development for Packed Bed Chemical Reactors.
- Constantine Kravaris (*Chemical Engineering*) Diploma, National Technical University of Athens 1979; M.S., California Institute of Technology 1981.
Thesis: Identification of Spatially-Varying Parameters in Distributed Parameter Systems.
- Chia-lam Kuo (*Chemistry*) B.S., National Taiwan University 1978.
Thesis: Use of Temperature Sensitive Mutants to Study Yeast DNA Replication.
- Chi-Woo Lee (*Chemistry*) B.S., Korea University 1976; M.S., 1978.
Thesis: Adsorption and Electrochemistry of Bis-1, 10-Phenanthroline Complexes of Copper (I,II) and Fungal Laccase A.
- Gerasimos Lyberatos (*Chemical Engineering*) S.B., Massachusetts Institute of Technology 1980; M.S., California Institute of Technology 1982.
Thesis: Dynamic and Steady-State Bifurcation for Modeling Chemical Reaction Systems.
- Lisa Ann McElwee-White (*Chemistry*) B.S., University of Kansas, Lawrence 1979.
Thesis: Theoretical and Experimental Assessment of the Viability of 1,4,6,9-Spiro [4.4]nonatetrayl as a Reactive Intermediate.
- William Kevin Moonan (*Chemical Engineering*) B.Ch.E., University of Minnesota 1975.
Thesis: Superposition of the Effects of Time, Temperature and Pressure in Polymeric Materials.

DOCTOR OF PHILOSOPHY — *Continued*

- Eric Jan Moore (*Chemistry*) B.S., M.S., Stanford University 1979.
Thesis: Synthetic, Structural and Mechanistic Studies of Interactions of Carbon, Nitrogen and Oxygen Nucleophiles with Bis-Pentamethylcyclopentadienyl Zirconium and Hafnium Derivatives.
- David Randall Moser (*Chemistry*) B.S., University of North Carolina, Chapel Hill 1979.
Thesis: Regulation of Col E1 Plasmid DNA Replication in *Escherichia coli*.
- Daniel George Nocera (*Chemistry*) B.A., Rutgers College 1979.
Thesis: Spectroscopy, Electrochemistry and Photochemistry of Polynuclear Metal-Metal Bonded Complexes.
- Laurence Timothy Pearson (*Chemistry*) B.Sc., Aston University 1978.
Thesis: A Model for the Lateral Organisation of Protein Molecules in Lipid Bilayers.
- Joseph Walter Perry (*Chemistry*) B.S., University of South Florida 1977.
Thesis: Nature and Energy Redistribution of Highly Vibrationally Excited Polyatomic Molecules.
- Dean Michael Roddick (*Chemistry*) B.S., University of California, Berkeley 1979.
Thesis: Synthesis, Structure and Reactivity of Hydride and Phosphide Complexes of Hafnium and Zirconium.
- Ka-Yiu San (*Chemical Engineering*) B.S., Rice University 1978; M.S., California Institute of Technology 1981.
Thesis: Studies on the On-Line Identification and Optimal Control of Bioreactors.
- Jocelyn Chupka Schultz (*Chemistry*) B.A., Wesleyan University 1978.
Thesis: Photoelectron Spectroscopy of Alkyl and Alkenyl Free Radicals.
- Peter G. Schultz (*Chemistry*) B.S., California Institute of Technology 1979.
Thesis: I. Ground and Excited State Studies of Persistent 1,1-Diazenes. II. Design of Sequence Specific DNA Cleaving Molecules.
- Thomas Loong Shih (*Chemistry*) B.A., Ithaca College 1978.
Thesis: Use of Enantioselective Aldol Condensations: Efforts Directed towards the Total Synthesis of Ionomycin.
- Michael Louis Steigerwald (*Chemistry*) B.S., California Institute of Technology 1978.
Thesis: $2s + 2s$ Reactions at Transition Metals.
- Barry Allen Swartz (*Chemistry*) B.S., University of California, Davis 1976.
Thesis: Free Jet Expansion Laser Spectroscopy of van der Waals Molecules Containing Ne and Br₂.
- Michael Karpovich Templeton (*Chemical Engineering*) S.B., Massachusetts Institute of Technology 1978.
Thesis: The Identification of Stable Reaction Intermediates on Aluminum Oxide Surfaces with Inelastic Electron Tunneling Spectroscopy.
- Michael W. Van Dyke (*Chemistry*) B.A., Monmouth College 1979.
Thesis: MPE•Fe(II) Footprinting: Drug Binding Sites on Native DNA.

DOCTOR OF PHILOSOPHY — *Continued*

Jay Richmond Winkler (*Chemistry*) B.S., Stanford University 1978.
Thesis: Spectroscopy and Photochemistry of Metal-Oxo Complexes.

DIVISION OF ENGINEERING AND APPLIED SCIENCE

Mustafa A. G. Abushagur (*Electrical Engineering*) B.Sc.E.E., University of Tripoli 1974; M.S., California Institute of Technology 1977.
Thesis: Scattering of Light from Large Cylinders.

Md Khairul Alam (*Mechanical Engineering*) B.Tech., Indian Institute of Technology, Kanpur 1978; M.S., California Institute of Technology 1979.
Thesis: Nucleation and Condensational Growth of Aerosols: Application to Silicon Production.

Jean-Pierre Bardet (*Civil Engineering*) Diplôme d'Ingénieur, Ecole Centrale de Lyon 1978; M.S., California Institute of Technology 1979.
Thesis: Application of Plasticity Theory to Soil Behavior: A New Sand Model.

Meir Bartur (*Electrical Engineering*) B.Sc., Technion, Israel Institute of Technology 1975; M.S., California Institute of Technology 1980.
Thesis: Utilization of Silicides for VLSI - Contacts with Aluminum and Thermal Oxidation.

David Verge Baxter (*Applied Physics*) B.Sc., University of Alberta 1979; M.S., California Institute of Technology 1981.
Thesis: Extended X-Ray Absorption Fine Structure Studies of La-Ga Metallic Glasses.

John Michael Cimbala (*Aeronautics*) B.S., The Pennsylvania State University 1979; M.S., California Institute of Technology 1980.
Thesis: Large Structure in the Far Wakes of Two-Dimensional Bluff Bodies.

Jean-Luc Cornet (*Engineering Science*) Diplôme d'Ingénieur, Ecole Spéciale de Mécanique et d'Electricité 1977; M.S., California Institute of Technology 1978.
Thesis: Evaluation of the Unsteady Effects for a Class of Wind Turbines.

K. Jeffrey Eriksen (*Engineering Science/Bioinformation Systems*) B.S., California Institute of Technology 1976.
Thesis: Biophysical Source Modelling of Some Exogenous and Endogenous Components of the Human Event-Related Potential.

Glenn Joel Greene (*Applied Physics*) B.A., University of California, San Diego 1975; M.S., California Institute of Technology 1977.
Thesis: ICRF Antenna Coupling and Wave Propagation in a Tokamak Plasma.

Jean-François Luc Haas (*Aeronautics and Geology*) B.S., Lycée Kléber (Strasbourg) 1970; Diplôme d'Ingénieur, Ecole Nationale d'Ingénieurs de Constructions Aéronautiques 1975; M.S., California Institute of Technology 1976.
Thesis: Interaction of Weak Shock Waves and Discrete Gas Inhomogeneities.

DOCTOR OF PHILOSOPHY — *Continued*

- Kuo Ting Ho (*Applied Physics*) S.B., Massachusetts Institute of Technology 1978;
M.S., California Institute of Technology 1980.
Thesis: Evolution of Nitrogen Impurities in Metal-Silicon Binary Couples and Their Effect on Silicide Formation.
- Tai-Ping Ho (*Computer Science*) B.S., National Chung-Hsing University 1971;
M.S., The University of Tennessee, Knoxville 1978; M.S., California Institute of Technology 1980.
Thesis: The Dialogue Designing Dialogue System.
- James Evan Houseworth (*Environmental Engineering Science*) B.S., California Institute of Technology 1977; M.S., 1978.
Thesis: Longitudinal Dispersion in Nonuniform, Isotropic Porous Media.
- Moh-jiann Huang (*Civil Engineering*) B.S., National Taiwan University 1977;
M.S., California Institute of Technology 1979.
Thesis: Investigation of Local Geology Effects on Strong Earthquake Ground Motions.
- Behnam Hushmand (*Civil Engineering*) B.S., Arya-Mehr University of Technology 1977; M.S., California Institute of Technology 1978.
Thesis: Experimental Studies of Dynamic Response of Foundations.
- Manoochehr Mohseni Koochesfahani (*Aeronautics*) B.S., Rensselaer Polytechnic Institute 1977; M.S., California Institute of Technology 1978.
Thesis: Experiments on Turbulent Mixing and Chemical Reactions in a Liquid Mixing Layer.
- Christian Mailhot (*Applied Physics*) B. Ing., Université de Montréal, Ecole Polytechnique 1978; M.S., California Institute of Technology 1980.
Thesis: Theoretical Investigations of Electron States in Small-Scale Semiconductor Structures.
- Daniel Margoliash (*Engineering Science and Neurobiology*) B.S., California Institute of Technology 1975; M.S., 1981.
Thesis: Songbirds, Grandmothers, Templates: A Neuroethological Approach.
- Dean Paul Neikirk (*Applied Physics*) B.S., Oklahoma State University 1979;
M.S., California Institute of Technology 1981.
Thesis: Integrated Detector Arrays for High Resolution Far-Infrared Imaging.
- Khai Doan The Ngo (*Electrical Engineering*) B.S., California State Polytechnic University, Pomona 1979; M.S., California Institute of Technology 1980.
Thesis: Topology and Analysis in PWM Inversion, Rectification and Cycloconversion.
- Alexandros Christou Papachristidis (*Computer Science*) Diploma of Mechanical and Electrical Engineering, National Technical University of Athens, 1979; M.S., California Institute of Technology 1980.
Thesis: Heterogeneous Data Base Access.
- Panayiotis Nikolas Papanicolaou (*Civil Engineering*) B.Sc., National Technical University of Athens 1978; M.S., California Institute of Technology 1979.
Thesis: Mass and Momentum Transport in a Turbulent Buoyant Vertical Axisymmetric Jet.

DOCTOR OF PHILOSOPHY — *Continued*

William M. Polivka (*Electrical Engineering*) B.S., The Pennsylvania State University 1974; M.S., California Institute of Technology 1979.

Thesis: Applications of Magnetics to Problems in Switched-Mode Power Conversion.

Allen Conrad Robinson (*Applied Mathematics*) B.S., Brigham Young University 1979.

Thesis: Existence and Stability of Vortices and Vortex Arrays.

Robert Schulz (*Applied Physics*) B. Ing., Université de Montréal, Ecole Polytechnique, 1978; D.E.A., Université Paul Sabatier de Toulouse 1979; M.S., California Institute of Technology 1980.

Thesis: Electrical Transport during Phase Transformation in Metallic Glasses.

Constance Lynn Senior (*Environmental Engineering Science and Chemical Engineering*) B.S., Rice University 1978; M.S., California Institute of Technology 1979.

Thesis: Submicron Aerosol Formation during Combustion of Pulverized Coal.

Jeffrey Alan Simmen (*Applied Mathematics*) B.S., California Institute of Technology 1977; M.S., Cornell University 1979.

Thesis: Steady Deep-Water Waves on a Linear Shear Current.

Noel Frederick Smyth (*Applied Mathematics*) B.Sc., University of Queensland 1979.

Thesis: I: Soliton on a Beach and Related Problems. II: Modulated Capillary Waves.

Vatché Vorpérian (*Electrical Engineering*) B.S., Northeastern University 1976; M.S., 1977.

Thesis: Analysis of Resonant Converters.

Chiun Wang (*Aeronautics*) B.S., National Taiwan University 1972; M.S., 1974.

Thesis: The Effects of Curvature on Turbulent Mixing Layers.

Larry Kevin Warne (*Electrical Engineering*) B.S., Fairleigh Dickinson University 1976; M.S., California Institute of Technology 1977.

Thesis: Electromagnetic Radiation and Scattering in a Plasma with an Azimuthal Biasing Field.

Jeffrey Owen White (*Applied Physics*) Sc.B., Brown University 1977; M.S., California Institute of Technology 1980.

Thesis: Four-Wave Mixing and Optical Phase Conjugation in Photorefractive Crystals.

John Charles Wilson (*Civil Engineering*) B.Eng., McMaster University 1977; M.Eng., 1980.

Thesis: Analysis of the Observed Earthquake Response of a Multiple Span Bridge.

James Michael Winget (*Applied Mechanics*) B.S., University of Cincinnati 1977; M.S., California Institute of Technology 1978.

Thesis: Element-by-Element Solution Procedures for Nonlinear Transient Heat Conduction Analysis.

DOCTOR OF PHILOSOPHY — *Continued*

Vigor Yang (*Mechanical Engineering*) B.S., National Tsing Hua University 1976; M.S., The Pennsylvania State University 1980.

Thesis: Pressure Oscillations in Liquid-Fueled Ramjet Engines.

Paul Kit-Lai Yu (*Applied Physics*) B.S., M.S., California Institute of Technology 1979.

Thesis: Long Wavelength InGaAsP/InP Lasers and Optoelectronic Integration.

Amikam Zur (*Applied Physics*) B.Sc., Tel Aviv University 1972; M.Sc., 1973.

Thesis: Theoretical Investigations of Solid Interfaces: 1. The Position of the Fermi Level at a Metal-Semiconductor Interface. 2. Geometric Lattice Match and Its Application to Heteroepitaxy. 3. AB-Initio Calculations of the Elastic Properties of Silicon, Using Small Clusters.

DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES

Roger Deane Aines (*Geochemistry*) B.A., Carleton College 1977.

Thesis: Trace Hydrogen in Minerals.

Mark Bruce Boslough (*Applied Physics and Geophysics*) B.S., Colorado State University 1977; M.S., California Institute of Technology 1978.

Thesis: Shock-Wave Properties and High-Pressure Equations of State of Geophysically Important Materials.

Edward John Corbett (*Geophysics and Geology*) B.S., University of California, Berkeley 1973; M.Eng., 1977.

Thesis: Seismicity and Crustal Structure Studies of Southern California: Tectonic Implications from Improved Earthquake Locations.

Lucien Froidevaux (*Planetary Science and Astronomy*) B.S., University of California, Los Angeles 1976; M.S., California Institute of Technology 1981.

Thesis: Photochemical Modeling of the Earth's Stratosphere.

Jeffrey Wayne Given (*Geophysics*) B.S., Colorado School of Mines 1974; M.S., 1976.

Thesis: Inversion of Body-Wave Seismograms for Upper Mantle Structure.

Robert Ian Hill (*Geology*) B.Sc., Australian National University 1975; M.Sc., 1977.

Thesis: Petrology and Petrogenesis of Batholithic Rocks, San Jacinto Mountains, Southern California.

Anne Marie Hofmeister (*Geology*) B.S., Harvey Mudd College 1976; M.S., University of Illinois 1978; M.S., California Institute of Technology 1981.

Thesis: A Spectroscopic and Chemical Study of the Coloration of Feldspars by Irradiation and Impurities, Including Water.

Peter Brennan Larson (*Geology*) B.S., Michigan Technological University 1973; M.S., The University of Arizona 1976.

Thesis: I. An $^{18}\text{O}/^{16}\text{O}$ Investigation of the Lake City Caldera, San Juan Mountains, Colorado. II. $^{18}\text{O}/^{16}\text{O}$ Relationships in Tertiary Ash-Flow Tuffs from Complex Caldera Structures in Central Nevada and the San Juan Mountains, Colorado.

DOCTOR OF PHILOSOPHY — *Continued*

Kristian Erik Meisling (*Geology*) B.S., University of California, Los Angeles 1977; M.S., California Institute of Technology 1978.

Thesis: Neotectonics of the North Frontal Fault System of the San Bernardino Mountains, Southern California: Cajon Pass to Lucerne Valley.

Donald John Piepgras (*Geochemistry*) B.S., University of Miami 1975; M.S., Oregon State University 1979.

Thesis: The Isotopic Composition of Neodymium in the Marine Environment: Investigations of the Sources and Transport of Rare Earth Elements in the Oceans.

Henry Francis Shaw III (*Geology and Chemistry*) B.A., Amherst College 1977; M.S., California Institute of Technology 1978.

Thesis: Sm-Nd and Rb-Sr Isotopic Systematics of Tektites and Other Impactites, Appalachian Mafic Rocks, and Marine Carbonates and Phosphates.

Marianne Carol Walck (*Geophysics*) A.B., Hope College 1978; M.S., California Institute of Technology 1981.

Thesis: Teleseismic Array Analysis of Upper Mantle Compressional Velocity Structure.

DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

Kenneth Frank McCue (*Social Science*) B.G.S., University of Kansas 1976; M.A., 1978.

Thesis: The Structure of Individual Decisions in American Elections: The Influence of Relevant Alternatives.

Asha B. Sadanand (*Social Science*) B.Sc., University of Alberta 1977; M.A., 1978.

Thesis: Three Essays in Law and Economics.

Stephen Richard Selinger (*Social Science*) A.B., Harvard College 1975; Ph.D., Princeton University 1979.

Thesis: Three Essays in Applied and Normative Economics.

DIVISION OF PHYSICS, MATHEMATICS AND ASTRONOMY

Eugene David Brooks III (*Physics*) B.S., University of Maryland 1977; M.S., California Institute of Technology 1980.

Thesis: Non-Perturbative Analysis of Some Simple Field Theories on a Momentum Space Lattice.

Alexei Vladimir Filippenko (*Astronomy*) B.A., University of California, Santa Barbara 1979.

Thesis: Physical Conditions in Low-Luminosity Active Galactic Nuclei.

DOCTOR OF PHILOSOPHY — *Continued*

- Joel Christopher Fowler (*Mathematics*) B.S., M.S., Emory University 1980.
Thesis: Topics in Linear Spaces and Projective Planes.
- Mark Hereld (*Physics and Computer Science*) B.S., University of California, Berkeley 1978; M.S., California Institute of Technology 1980.
Thesis: A Search for Gravitational Radiation from PSR 1937+214.
- Jeffrey George Koller (*Physics*) B.Sc., University of the Witwatersrand 1978;
B.Sc. (Honours), 1979.
Thesis: Yang-Mills Theory in Six-Dimensional Superspace.
- Dale E. Koop (*Physics*) B.S., (Biology) California State Polytechnic University, Pomona 1975; B.S., (Physics) 1977.
Thesis: Prompt Electron Production in Electron Positron Annihilations at 29 GeV.
- Stephen Morris Lichten (*Astronomy*) A.B., Harvard College 1978.
Thesis: Turbulence and Mass Motion in Galactic Molecular Clouds.
- Douglas Alan Macdonald (*Physics*) B.S., Florida State University 1975; M.S., California Institute of Technology 1981.
Thesis: Black-Hole Electrodynamics.
- David Brian MacFarlane (*Physics*) B.A.Sc., University of Toronto 1978.
Thesis: Nucleon Structure from Neutrino Interactions in an Iron Target with a Study of the Singlet Quark Distribution.
- Neil Marcus (*Physics*) B.Sc., University of the Witwatersrand 1978; B.Sc. (Honours), 1979.
Thesis: Finiteness in Supersymmetric Theories.
- Igor Mikolic-Torreira (*Mathematics*) B.A., Sacred Heart University 1979.
Thesis: Norm Constant Holomorphic Functions on Banach Spaces.
- Richard Allan Partridge (*Physics*) B.S., University of Minnesota 1975.
Thesis: A Study of the ψ' (3770) Using the Crystal Ball Detector.
- Apoorva Dayaram Patel (*Physics*) M.Sc., Indian Institute of Technology, Bombay 1980.
Thesis: Monte-Carlo Renormalisation Group for Lattice QCD.
- Milind Vasant Purohit (*Physics*) M.Sc., Indian Institute of Technology, Delhi 1978.
Thesis: Nucleon Structure Functions from ν_μ -Fe Interactions and a Study of the Valence Quark Distribution.
- Ian H. Redmount (*Physics*) B.S., Michigan State University 1978; M.S., California Institute of Technology 1981.
Thesis: Topics in Black-Hole Physics: Geometric Constraints on Noncollapsing Gravitating Systems and Tidal Distortions of a Schwarzschild Black Hole.
- Douglas Alan Reinelt (*Applied Mathematics*) B.S., University of the Pacific 1978.
Thesis: The Penetration of a Finger into a Viscous Fluid.

DOCTOR OF PHILOSOPHY — *Continued*

Abhijit Saha (*Astronomy*) B.Sc., St. Stephen's College, University of Delhi 1976;
M.Sc., 1978.

Thesis: A Survey of Halo RR Lyrae Stars.

Michael Phillip Shatz (*Physics*) S.B., Massachusetts Institute of Technology 1979.

Thesis: A QCD Based Model of Hadron Hadron Scattering.

Byron Bong Siu (*Physics*) B.A., Princeton University 1979; M.S., California Institute
of Technology 1981.

Thesis: Upper Bounds on the Magnetization of Ferromagnetic Ising Models.

Saleh Ahmed Tanveer (*Applied Mathematics*) B.A., Pomona College 1979; M.A.,
Claremont Graduate School 1979; M.S., California Institute of Technology 1982.

Thesis: Topics in 2-D Separated Vortex Flows.

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 an aeronautics student for an outstanding doctoral dissertation.

Manoocher Mohseni Koochesfahani

ERIC TEMPLE BELL UNDERGRADUATE MATHEMATICS RESEARCH PRIZE

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

1984 Bradley W. Brock, senior; Alan G. Murray, senior

*1983 Mark R. Purtill**

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>Alex K. Bouzari</i>	<i>Stuart Elgin Goodnick</i>	<i>Candice McCoy</i>
<i>Bradley Wayne Brock</i>	<i>Richard Edward Honrath, Jr.</i>	<i>Janet Ayako Tamada</i>
<i>Howard Ze Hua Chen</i>	<i>Robert Emmett Kelly, Jr.</i>	<i>Ted Eugene Williams</i>
<i>Pang-Chieh Chen</i>	<i>Asad Khan</i>	<i>Ned Scott Wingreen</i>
<i>Jeffrey A. Clayhold</i>	<i>Tak Leuk David Kwok</i>	<i>Kriengkrai Wisanrakkit</i>
<i>John Edward Eng</i>	<i>Wuwell Liao</i>	

**The names of students who have received prizes or awards in previous years, but who are graduating in 1984, are also listed.*

PRIZES AND AWARDS — *Continued*

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.

James E. Houseworth

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.

1984 *Praveen Asthana, junior; Richard M. Murray, junior*

1983 *Richard E. Honrath, Jr.,* Donald Laurence Meixner**

1982 *Jerry R. Burch**

1981 *Charlotte B. Clark**

HAREN LEE FISHER MEMORIAL AWARD IN JUNIOR PHYSICS

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

1984 *Eric H. Kawamoto*

1983 *Kenneth Hui**

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.

Hojin Ahn, junior

JACK E. FROELICH 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.

1984 *James Dunn*

1983 *Ned S. Wingreen**

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.

Catherine K. Ifune, junior; Tak Leuk David Kwok, senior

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.

1984 *David P. Watkins, junior*

1983 *Candice McCoy,* Eliza L. Sutton**

INSTITUTE FOR THE ADVANCEMENT OF ENGINEERING AWARD

Awarded to a student who exhibits a professional attitude toward engineering by a leadership role in the student chapter of a professional organization, such as the IEEE, ASCE, ASME.

John H. Chang, senior

DAVID JOSEPH MACPHERSON PRIZE IN ENGINEERING

Awarded to the graduating senior in engineering who best exemplifies excellence in scholarship.

Morris Joel Katz

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.

1984 *Harold M. Weiser, senior; Ned S. Wingreen, senior*

1982 *Michael Turyn**

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.

Paul E. Filmer, junior; Eliza L. Sutton, senior

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.

Douglas Mark Ruden

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.

Dov Elyada

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.

1984 *Karl R. Clauser, sophomore; Matthew J. Penn, sophomore;
Thanh-Van Tran-Hut, junior*

1983 *Barbara J. Turpin**

1981 *Tracy T. Furutani**

SIGMA XI AWARD

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

Kenneth Hui, Eric Ting-Shan Pan

THE MORGAN WARD PRIZE

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

1982 *Alan G. Murray**

1981 *Alan G. Murray**