



*Ninety-Fifth
Annual Commencement
June 16, 1989*

CALIFORNIA INSTITUTE OF TECHNOLOGY

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Annual
Commencement

FRIDAY MORNING AT TEN O'CLOCK
JUNE SIXTEENTH, NINETEEN EIGHTY-NINE

The Commencement Ceremony

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

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

These 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 girls and choir boys and even to the nursery school. *Sic transit. . . .*

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

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

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

David C. Elliot
Professor of History, Emeritus

Academic Procession

Chief Marshal, Jenijoy La Belle, Ph.D.

Assistant Marshals

Arden L. Albee, Ph.D.	Christopher E. Brennen, D.Phil.
Robert W. Oliver, Ph.D.	David B. Wales, Ph.D.
Ward Whaling, Ph.D.	David S. Wood, Ph.D.

Faculty Officers

Sunney I. Chan, Ph.D.	Bruce E. Cain, Ph.D.
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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 George Mann
First United Methodist Church of Pasadena

PRESENTATION OF DISTINGUISHED
ALUMNI AWARD TO JAMES J. DUDERSTADT Dr. Mettler

COMMENCEMENT ADDRESS James J. Duderstadt, Ph.D.
President, University of Michigan

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

“Hallelujah” from *Messiah*
George Frederick Handel

The audience will please rise during the singing of the “Hallelujah” chorus.

CONFERRING OF DEGREES Thomas E. Everhart, Ph.D.
*President
California Institute of Technology*

PRESENTATION OF CANDIDATES FOR DEGREES

For the Degree of Bachelor of Science . Christopher E. Brennen, D.Phil.
Dean of Students

For the Degree of Master of Science James J. Morgan, Ph.D.
Vice President for Student Affairs

For the Degree of Engineer Dr. Morgan

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

Biology Norman R. Davidson, Ph.D.
Acting Division Chairman

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 . . Samuel Epstein, Ph.D., LL.D.
William E. Leonhard Professor of Geology

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

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

CONCLUDING REMARKS President Everhart

ALMA MATER The Caltech Glee Clubs
The Caltech Wind Ensemble Brass and Organ

BENEDICTION Reverend Mann

RECESSIONAL . . . The Caltech Wind Ensemble Brass and Organ

ORGAN POSTLUDE Dr. Deutsch

Candidates for Degrees

BACHELOR OF SCIENCE

- Ahmed Abd-El-Shafy Abd-Allah *Riverside, California* Electrical Engineering
Martin B. Adler *Glendale, Arizona* Engineering and Applied Science
Khurram Khan Afridi* *Lahore, Pakistan* Electrical Engineering
Ghufran Ahmed* *Karachi, Pakistan* Engineering and Applied Science
Salim Ahmed *Dhaka, Bangladesh* Engineering and Applied Science
Raza Akbar *Karachi, Pakistan* Engineering and Applied Science
Heidi Lee Anderson *Lake Tahoe, California* Geophysics
Elisabeth Andrews *Pasadena, California* Chemical Engineering
Timothy Mark Archer *Vancouver, Washington* Applied Physics
Paisan Atsavaprane *Bangkok, Thailand* Engineering and Applied Science
John Fuller Avery *Portland, Oregon* Mathematics
Babak Ayazifar* *Tehran, Iran* Electrical Engineering
Mihai Dumitru Azimioara* *Downey, California* Chemistry
David Andrew Ball* *Renton, Washington* Electrical Engineering
Jerome D. Banks *Budd Lake, New Jersey* Engineering and Applied Science
Oren Bergman* *Albany, California* Physics
Thomas Robinson Bewley* *Eatonville, Washington* Engineering and Applied Science
H. Douglass Bloomer *Flagstaff, Arizona* Physics
Sandra Kaye Blumhorst *Marshall, Missouri* Chemical Engineering
Christopher Llewellyn Bond* *Dover, Vermont* Engineering and Applied Science
Paul Anthony Bonenfant* *Nanuet, New York* Engineering and Applied Science
John Edward Bowers *St. Helena, California* Biology
Randall Wayne Bownds* *San Ramon, California* Electrical Engineering
Matthew Alexis Breaden *San Diego, California* Engineering and Applied Science
Paul Joseph Brewer *Chattanooga, Tennessee* Physics
Jared Charles Bronski* *Randolph, Massachusetts* Applied Mathematics
James Lin Burleigh, Jr. *San Diego, California* Engineering and Applied Science
Paul Anthony Cabral *Trinidad, West Indies* Electrical Engineering and Economics
Cameron Dougall Campbell* *De Kalb, Illinois* Engineering and Applied Science and History
Peter Dennis Capofreddi* *Newton, Massachusetts* Electrical Engineering
Suman Chakrabarti *Wantagh, New York* Engineering and Applied Science

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

BACHELOR OF SCIENCE—*Continued*

- Victor J. Chan* *Ventura, California* Electrical Engineering
Hasok Chang* *Seoul, Korea* Independent Studies Program
Somechart Chantasiriwan* *Bangkok, Thailand* Engineering and Applied Science
Daniel N. Chen* *New York, New York* Electrical Engineering
Irene Hsiao-Ping Chen *Seal Beach, California* Applied Physics
Kay-Yut Chen* *Hong Kong, B.C.C.* Physics
Stanley F. Chen* *Stony Brook, New York* Mathematics
Raleigh Wei-Jye Chiu *Lawrenceville, New Jersey* Engineering and Applied Science
Brian Michael Chizever *Great Neck, New York* Engineering and Applied Science
Garrett Wilson Choi *Honolulu, Hawaii* Engineering and Applied Science
Walter Gee Chen Chong *Honolulu, Hawaii* Engineering and Applied Science
Carol J. Choy *Wahiawa, Hawaii* Engineering and Applied Science
Christopher Martin Chu* *Irvine, California* Electrical Engineering
Diana Chui-ngan Chu* *Sacramento, California* Electrical Engineering
Yong Song Chu *Washington, D. C.* Physics
Johnson Cheng-Chun Chung *Taiwan, R.O.C.* Biology
Rachael Ann Clark* *Kennewick, Washington* Biology and Chemistry
Brian William Colder *Glen Burnie, Maryland* Engineering and Applied Science
David Cole *Nassau, New York* Engineering and Applied Science
David John Colello* *Milford, Connecticut* Electrical Engineering
Brett Warren Coon *Broken Arrow, Oklahoma* Electrical Engineering
John Vernon Cordes* *Claremont, California* Electrical Engineering
Gabriela Teresa Cornejo *Glendale, California* Chemistry
James Barker Coykendall IV* *Pittmann Center, Tennessee* Mathematics
Susan Mary Danck *Old Bridge, New Jersey* Biology
Vivek Ramesh Dave* *Franconia, New Hampshire* Engineering and Applied Science
James Andrew Davila *Corpus Christi, Texas* Engineering and Applied Science
Richard George Dekany* *LaPalma, California* Applied Physics
Samer Diab *Helenburgh, Scotland* Electrical Engineering
Michael Howard Douglas *New City, New York* Engineering and Applied Science
Jay Parker Ebersohl *Fairview Heights, Illinois* Engineering and Applied Science
Dean Clark Elzinga *Longmont, Colorado* Mathematics
Miguel Stephen Errea, Jr. *San Ardo, California* Engineering and Applied Science
Andrew Alex Essen *Toledo, Ohio* Engineering and Applied Science
Douglas William Evans *Rochester, New York* Engineering and Applied Science
Joseph Miguel Fierro *Moorpark, California* Physics
Donald Edwin Finnell* *Winnetka, Illinois* Physics
Mark Andrew Fischman *Topeka, Kansas* Electrical Engineering

BACHELOR OF SCIENCE — *Continued*

- Jeffrey J. Flint *Upper Arlington, Ohio* Social Science
Dave Flowers, Jr. *Atlanta, Georgia* Engineering and Applied Science
Selena Mae Forman* *Ely, Nevada* Engineering and Applied Science
Michael Jon Freeman* *Okemos, Michigan* Electrical Engineering
Michael Toyoki Fukuda *Vista, California* Engineering and Applied Science
Mark Lewis Fussell *Bryn Mawr, Pennsylvania* Engineering and Applied Science
Dragan Gajić *Beograd, Yugoslavia* Applied Physics
W. Daniel Garretson* *Vienna, Virginia* Physics
José Miguel González* *S/C De Tenerife, Spain* Physics and Engineering and Applied Science
Roger Mark Goodman *Los Angeles, California* Chemistry
Ron Carl Goodman *North Hollywood, California* Engineering and Applied Science
Teresa Michelle Griffie *San Francisco, California* Applied Mathematics
Shane Lorell Groff *Elk Grove, California* Mathematics
Jung Shin Gwon *Highland, California* Engineering and Applied Science
Yuk Lung Ha* *Los Angeles, California* Chemical Engineering
Christopher David Habecker *Estes Park, Colorado* Applied Physics
Joseph Michael Hall* *Silverdale, Washington* Electrical Engineering
John Michael Hart *Orange Park, Florida* Biology
Jeffrey Joseph Hartt *Denver, Colorado* Electrical Engineering
Robert Allen Hawley* *Grand Blanc, Michigan* Electrical Engineering
Brian Thomas Hayes* *Charlotte, North Carolina* Physics
Clark Allan Highstrete *Fallbrook, California* Applied Physics
Erik D. Hille *Seattle, Washington* Biology
Sean Edward Hillyard* *Oakhurst, California* Applied Physics
Timothy Alan Hochberg *Santa Cruz, California* Applied Physics
Wolfgang Maximilian Josef Hofmann* *Munich, West Germany* Physics and Electrical Engineering
Derek Calvin Holland *Denver, Colorado* Electrical Engineering
Jordan Leland Holt *McMinnville, Oregon* Electrical Engineering
Wonhyuk Hong *Port Washington, New York* Engineering and Applied Science
Timothy Ken Horiuchi *Arcadia, California* Electrical Engineering
Andrew Chen-Chou Hsu *Northridge, California* Electrical Engineering
Richard Chang Hsu* *San Mateo, California* Engineering and Applied Science
Raymond John Hu *Monterey, California* Engineering and Applied Science
Shyh-Chyuan Huang* *Cerritos, California* Engineering and Applied Science
Farrukh Humayun *Faisalabad, Pakistan* Engineering and Applied Science
Donald Eugene Huntington *Lakeside, California* Engineering and Applied Science

BACHELOR OF SCIENCE—Continued

- Seth Lancefield Jelen *Lake Oswego, Oregon* Chemistry and Engineering and Applied Science
- Gregory Charles Jensen *Watsonville, California* Electrical Engineering
- Bibi Jentoft-Nilsen *Delhi, New York* Biology
- John Patrick Josephson *South Pasadena, California* Physics
- David Yiuk Jung *Chicago, Illinois* Engineering and Applied Science
- Aram Bedig Kaloustian *San Bruno, California* Engineering and Applied Science
- Andrew Stephan Kaluzniacki *Mesa, Arizona* Physics
- Todd Revel Kaplan *Lawrenceville, New Jersey* Economics and Engineering and Applied Science
- Janet Lee King* *Chico, California* Applied Mathematics
- Imran Kizilbash* *Karachi, Pakistan* Engineering and Applied Science
- Michael Scott Klein* *Shaker Heights, Ohio* Physics
- David Brian Knight *Falls Church, Virginia* Electrical Engineering
- Ronald C. Kong* *Alhambra, California* Electrical Engineering
- Yogi Yoghish Krikorian* *Los Angeles, California* Engineering and Applied Science
- Erik Peter Krumrey *Traverse City, Michigan* Applied Physics
- John Mitsuaki Kubodera* *Honolulu, Hawaii* Engineering and Applied Science
- Josh W. Kurutz *Pasadena, California* Chemistry
- James Russell Kuyper, Jr. *Pasadena, California* Physics
- Philip See-Wah Kwan *Kowloon, Hong Kong* Engineering and Applied Science
- Alan Youssef Kwentus *Bakersfield, California* Electrical Engineering
- Torrance Mathew Lawton *Lancaster, California* Electrical Engineering
- James Michael Layland* *La Cañada, California* Applied Physics
- Anh Tuan Le* *Anaheim, California* Engineering and Applied Science
- Quynh-Thu Xuan Le* *Sacramento, California* Biology and Chemistry
- Alan Joe Lee* *Sacramento, California* Engineering and Applied Science
- Andrew Lee* *New York, New York* Physics and Mathematics
- David Michael Lee* *Los Angeles, California* Electrical Engineering
- Eun Kyung Lee *Hawthorne, California* Biology
- Paul Ung-Joon Lee *Seoul, Korea* Engineering and Applied Science
- Philip Hyonsu Lee *Huntsville, Alabama* Engineering and Applied Science
- Brian Elliot Lemoff* *Hingham, Massachusetts* Physics
- Devin Blaine Leonard *Clovis, California* Engineering and Applied Science
- Randy Scott Levinson* *Miramar, Florida* Biology
- Stephen Donald Lew* *Lakewood, Colorado* Electrical Engineering
- Ann Justina Lewis* *Merced, California* Biology and Chemistry
- Philip Jin-Yi Lin* *Hacienda Heights, California* Engineering and Applied Science

BACHELOR OF SCIENCE—Continued

- Barry Jay Lind* *Fremont, Wisconsin* Economics
Peter Allan Lindstrom, Jr.* *Irving, Texas* Chemistry
Harvey I-Heng Liu* *Chino, California* Electrical Engineering
Gary James Ludlam *Steamboat Springs, Colorado* Physics
Daniel John Mahoney* *South Bend, Indiana* Applied Mathematics
Jesús Maíz Apellániz* *San Sebastian, Spain* Physics and Geophysics
Michael Edward Malcom* *Salem, Oregon* Electrical Engineering
Edward Si-Lo Mao* *Dallas, Texas* Electrical Engineering
Heath Allen Maxfield *Mariposa, California* Engineering and Applied Science
Leslie Ann McCaffree *Novato, California* Engineering and Applied Science
Michael Patrick McDonald *Gastonia, North Carolina* Economics
Bruce Anthony Miller *North Hollywood, California* Electrical Engineering
William Edward Mitchell *Irvine, California* Engineering and Applied Science
Keith Minoru Miyake *Lihue, Hawaii* Engineering and Applied Science
Bassem Nabih Mora* *Damascus, Syria* Biology
Dee Herma Morrison *Rochester, Minnesota* Engineering and Applied Science
Carol Anelle Mullenax *Dallas, Texas* Engineering and Applied Science
Junko Munakata* *Brecksville, Ohio* Chemical Engineering
Paresh Srinivas Murthy *Ahmedabad, India* Mathematics
Edward Naranjo *Miami, Florida* Chemical Engineering
David Scott Newhall *Pasadena, California* Engineering and Applied Science
Man-Ho Raymond Ngai* *Hong Kong, B.C.C.* Electrical Engineering
Jeffrey Hung-Phi Nguyen* *Carol Stream, Illinois* Physics
James Andrew O'Dea *Manhattan, Kansas* Electrical Engineering
Karen Faye Oegema* *Fridley, Minnesota* Chemistry
Teresa Nicole Ollick* *Mentor, Ohio* Biology
Ronald T. Park* *Oxnard, California* Engineering and Applied Science
Brian Dean Patterson *Las Vegas, Nevada* Engineering and Applied Science
Betina Elisabeth Pavri* *Pittsburgh, Pennsylvania* Engineering and Applied Science
Wayne G. Perley *West Linn, Oregon* Engineering and Applied Science
Eric Clayton Pierce *Covina, California* Physics
Craig Harvey Prouse *Eugene, Oregon* Electrical Engineering
Daniel Henri Raguin* *Medford, Massachusetts* Engineering and Applied Science
Peter Maurice Richardson *Gainesville, Florida* Engineering and Applied Science
Mark Daniel Rintoul III *Hattiesburg, Mississippi* Physics
Bruce Wharton Roberts* *Wise, Virginia* Applied Physics
Michael Eugene Rodeffer *Evergreen, Colorado* Applied Physics
Eric Christopher Rollins *Walla Walla, Washington* Electrical Engineering

BACHELOR OF SCIENCE — *Continued*

- Keith David Rosema *Seattle, Washington* Applied Physics
Arthur Bruce Rossiter *Tidioute, Pennsylvania* Engineering and Applied Science
Paul Michael Rubinov *Des Moines, Iowa* Physics
John Joseph Schuster *Phoenix, Arizona* Engineering and Applied Science
Bradley Allen Scott *Fountain Valley, California* Physics
John Henry Joseph Scott *Tunkhannock, Pennsylvania* Physics
Paul Andrew Searcy *Evergreen, Colorado* Engineering and Applied Science
Jane Seto *Los Angeles, California* Engineering and Applied Science
Amish J. Shah* *Los Angeles, California* Electrical Engineering
Sarvjit Devdat Shastri *Bombay, India* Applied Physics
Alex V. Shek* *Portland, Oregon* Electrical Engineering
Rebecca Yin-Shi Shen *San Dimas, California* Engineering and Applied Science
Julie Ann Sheridan* *Bryan, Ohio* Electrical Engineering
Tzejen James Shih* *Claremont, California* Chemistry and Literature
Glenn A. Smith* *Buffalo, New York* Physics
Laura Lynn Smith *Albany, Oregon* Engineering and Applied Science
Scott Stuart Snyder* *Huntsville, Alabama* Physics
Cheng Tai Song* *San Marino, California* Biology
Hisaho Sonoda *Torrance, California* Biology
Spiridon V. Spirou* *Athens, Hellas* Applied Physics
Atul Srinivasan *Sharjah, United Arab Emirate* Engineering and Applied Science
Balaji Srinivasan* *Calcutta, India* Mathematics
Dawn Yvonne Sumner* *Chehalis, Washington* Geology
Jonathan Tan *Los Angeles, California* Chemical Engineering
Thomas Archibald Tetzlaff* *Weatherby Lake, Missouri* Applied Physics
Eugene Russell Thomas *Simi Valley, California* Physics
Earl Young Tom* *Vallejo, California* Chemistry
Lawrence Michael Trout *Portland, Oregon* Applied Physics
Charles Su-Chang Tsai* *Salem, Oregon* Applied Physics
Jeffrey Chun-Lee Tseng* *Los Altos Hills, California* Physics
Thomas Allen Tucker *Littleton, Colorado* Physics
Kevin Eugene Underhill* *Seattle, Washington* Electrical Engineering
Keith Bradley Vanderveen* *Bethesda, Maryland* Mathematics
Thomas Eugene Wahl *Redding, California* Physics and Engineering and Applied Science
Samuel Paul Weaver *Knoxville, Tennessee* Engineering and Applied Science
Alexander Wei* *Malibu, California* Chemistry
Pierce T. Wetter III *Simi Valley, California* Electrical Engineering

BACHELOR OF SCIENCE—*Continued*

Patricia M. White *Joliet, Illinois* Biology
Corbet Ernest Wilcox *Pasadena, California* Engineering and Applied Science
Jeffrey William Willis *Socorro, New Mexico* Engineering and Applied Science
Cynthia Lou Wittman *Renton, Washington* Chemistry
Anthony Joseph Wittry *Ft. Madison, Iowa* Engineering and Applied Science
Felicity May Yan Wong *Brisbane, Queensland, Australia* Geophysics
John Derek Woolverton *Fresno, California* Engineering and Applied Science
Fumihisa Yamazaki *Honolulu, Hawaii* Engineering and Applied Science and
Economics
Miriam W. Y. Yee* *Honolulu, Hawaii* Engineering and Applied Science
Hsi-Jen Yeh* *Covina, California* Electrical Engineering
Terence Dat-Hung Yeh* *Hong Kong, B.C.C.* Electrical Engineering
Suk-hoon Yoon *New York, New York* Biology
Linley Mei Young* *Farmers Branch, Texas* Electrical Engineering
Chen Yuan* *McLean, Virginia* Engineering and Applied Science
Kyuson Yun *Rancho Palos Verdes, California* Biology

MASTER OF SCIENCE

- Khalid Ahmed Bin Talal AlJuhany (*Aeronautics*) B.S., The George Washington University 1987.
- Frédéric Jean-Philippe Andre (*Electrical Engineering*) Diplôme d'Ingénieur, École Supérieure d'Ingénieurs en Electrotechnique et Électronique 1989.
- Kurt Arthur Andrews (*Mechanical Engineering*) B.S., United States Military Academy 1977.
- Christopher Assad (*Electrical Engineering*) B.S., California Institute of Technology 1987.
- Talal Tarik Balaa (*Civil Engineering*) B.E., American University of Beirut 1988.
- Nadine Elizabeth Bandat (*Electrical Engineering*) B.S., The University of New Mexico 1986.
- Paul David Bantz (*Electrical Engineering*) B.S.E.E., University of Nevada-Reno 1988.
- William J. Benson (*Electrical Engineering*) B.S.E.E., The University of Virginia 1988.
- Bruce Harold Betts (*Planetary Science*) B.S., Stanford University 1987; M.S., 1987.
- Thomas Robinson Bewley (*Mechanical Engineering*) B.S., California Institute of Technology 1989.
- Abhijit Bhattacharyya (*Mechanical Engineering*) B. Tech., Indian Institute of Technology, Kharagpur 1988.
- Gary Robert Bloomberg (*Applied Mechanics*) B.A., Grinnell College 1985; B.S., California Institute of Technology 1987.
- François Pascal Boré (*Electrical Engineering*) Diplôme d'Ingénieur, École Supérieure d'Ingénieurs en Electrotechnique 1989.
- Julia Anne Bracker-Novak (*Chemistry*) B.A., California State University, Northridge 1986.
- Thomas Kingsley Brown (*Chemistry*) B.S., University of Pittsburgh 1986.
- Rex William Burington (*Applied Physics*) B.S., University of California, San Diego 1986.
- David William Burnett (*Aeronautics*) B.S., The University of Oklahoma 1987.
- Carlo Carraro (*Physics*) Laurea in Fisica, Università Degli Studi Di Padova 1984.
- Gert Cauwenberghs (*Electrical Engineering*) Burgerlijk Werktuigkundig Elektrotechnisch Ingenieur, Vrije Universiteit Brussel 1988.
- I-Ming Chen (*Mechanical Engineering*) B.S., National Taiwan University 1986.
- Eric Hao-Yun Chow (*Applied Mechanics*) B.A., B.S., University of Washington 1987.
- Christos Steliou Christoforou (*Mechanical Engineering*) B.S., Rice University 1988.
- Douglas Arthur Collins (*Physics*) B.A., Westmont College 1986.
- Stéphane Coutu (*Physics*) B.Sc., McGill University 1987.
- Michael Andrew Crocker (*Electrical Engineering*) B.S.E.E., University of Maryland at College Park 1987.
- David Matthew Davidson (*Aeronautics*) B.S., University of Arizona 1988.
- Ricardo Heinrich Diaz (*Aeronautics*) B.S., University of Maryland at College Park 1987.

MASTER OF SCIENCE — *Continued*

- Rajesh Venkata Dontula (*Civil Engineering*) B.Tech., Indian Institute of Technology, Madras 1988.
- Douglas Scott Dreger (*Geophysics*) B.S., University of California, Riverside 1987.
- Chrisanthi Economou (*Physics*) Diploma, National and Capodistrian University of Athens 1987.
- Kent William Eisele (*Aeronautics*) B.S., United States Military Academy 1981.
- Annmarie Eldering (*Environmental Engineering Science*) B.E., The Cooper Union 1988.
- Eliot M. Fried (*Applied Mathematics*) B.A., University of California, Berkeley 1981; B.S., California Polytechnic State University, San Luis Obispo 1986.
- Zezhong Fu (*Materials Science*) B.S., Jilin University 1982; M.S., 1985.
- Mary Ann Monica Fuhry (*Chemistry*) B.S., University of Pittsburgh 1986.
- Sarah Elizabeth Galt (*Chemical Engineering*) B.S., University of Delaware 1986.
- Ian Andrew Galton (*Electrical Engineering*) Sc.B., Brown University 1984.
- William Alexander Garnes, Jr. (*Electrical Engineering*) B.S., Rensselaer Polytechnic Institute 1988.
- Guillaume Georges Gavillet (*Aeronautics*) Diplôme d'Ingénieur, École Nationale Supérieure d'Électrotechnique, d'Électronique, d'Informatique et d'Hydraulique de Toulouse 1988.
- David Allen Gerken (*Engineering Science*) B.S., The University of Michigan 1987.
- Patrick Germain (*Aeronautics*) Bachelier en Ingenierie, École Polytechnique de Montréal 1988.
- Philippe Hubert Geubelle (*Aeronautics*) Candidat Ingénieur Civil, Université Catholique De Lovain 1985; Ingénieur Civil Mecanicien, 1988.
- Andrea Mia Ghez (*Physics*) B.S., Massachusetts Institute of Technology 1987.
- Jessica A. Goodfellow (*Social Science*) B.A., Brigham Young University 1987.
- Lisa Baugh Grant (*Environmental Engineering Science*) B.S., Stanford University 1985.
- Stanley Baugh Grant (*Environmental Engineering Science*) B.S., Stanford University 1985.
- Metin Mehmet Guner (*Physics*) B.S., Bogazici University 1985.
- Ashish Ram Gupta (*Electrical Engineering*) B.S.E.E., University of Florida 1987.
- Sanjay Omkarnath Gupta (*Electrical Engineering*) B.S., University of Colorado at Boulder 1988.
- Takahiro Hamada (*Electrical Engineering*) B.Eng., University of Tokyo 1985.
- Gregory Gerald Hennessy (*Social Science*) B.S., University of Houston 1987.
- Francis Ho (*Applied Physics*) B.S., California Institute of Technology 1988.
- Pamela Jo Hoffman (*Mechanical Engineering*) B.S., University of California, Berkeley 1988.
- Jiangtao Hong (*Physics*) B.S., University of Science and Technology of China 1987.
- Shu-San Hsiau (*Mechanical Engineering*) B.S., National Taiwan University 1985.
- Wen-Jean Hsueh (*Mechanical Engineering*) B.S., National Taiwan University 1987.

MASTER OF SCIENCE—Continued

- Todd Edwin Humes (*Electrical Engineering*) B.S., California Polytechnic State University, San Luis Obispo 1987.
- Ying-Wai Alex Ip (*Electrical Engineering*) B.A., Oxford University 1988.
- Hong Jiao (*Applied Physics*) B.S., University of California, Berkeley 1987.
- Dimitris Stylianos Kallifatides (*Physics*) Diploma, National and Capodistrian University of Athens 1987.
- Richard David Kaminsky (*Electrical Engineering*) B.S., Worcester Polytechnic Institute 1988.
- George Ioannis Kechriotis (*Electrical Engineering*) B.Sc., National Technical University of Athens 1988.
- Branislav Kecman (*Electrical Engineering*) B.S.E.E., University of Belgrade 1987.
- Imran Kizilbash (*Mechanical Engineering*) B.S., California Institute of Technology 1989.
- Gunnar Ulrich Klinkhammer (*Physics*) Vordiplom in Physics, Westfälische Wilhelms-Universität Münster 1986; Vordiplom in Mathematics, 1986.
- Diane Clemens Knott (*Geology*) B.S., University of California, Los Angeles 1984.
- David Ira Koenig (*Electrical Engineering*) B.S., The University of Connecticut 1988.
- Yogi Yoghish Krikorian (*Electrical Engineering*) B.A., Occidental College 1989; B.S., California Institute of Technology 1989.
- Barry Robert Krueger (*Materials Science*) B.S.E., University of Pennsylvania 1987.
- Thomas J. Kubr (*Aeronautics*) B.S.E., The University of Michigan 1987.
- John Lambros (*Aeronautics*) B.Eng., Imperial College of Science and Technology 1988.
- Thomas Edwin Lawson (*Electrical Engineering*) B.S., University of Nebraska-Lincoln 1981; M.S., The George Washington University 1986.
- Paul Eric Le Brun (*Applied Physics*) Candidat En Sciences Physiques, Université Catholique de Louvain 1986; Licence, 1988.
- Andrew Lee (*Physics*) B.S., California Institute of Technology 1989.
- Jonathan Patrick Leech (*Computer Science*) B.S., California Institute of Technology 1985.
- Brian Elliot Lemoff (*Physics*) B.S., California Institute of Technology 1989.
- Laurie Ann Leshin (*Geochemistry*) B.S., Arizona State University 1987.
- Jill Kirsten Lewis (*Physics*) University of California, Berkeley.
- Mo Li (*Materials Science*) B.S., Central China Institute of Technology 1982.
- Windsor Wen-Hsiang Lin (*Aeronautics*) B.S., California Institute of Technology 1988.
- Mark Dixon Looper (*Physics*) A.B., Princeton University 1985.
- David Stewart Loren (*Chemical Engineering*) B.S.E., The University of Michigan 1986.
- Melissa Mae Lunden (*Mechanical Engineering*) B.S., Texas Technological University 1987.

MASTER OF SCIENCE—*Continued*

- Saroj Manandhar (*Mechanical Engineering*) B.A., Ohio Wesleyan University 1987; B.S., California Institute of Technology 1988.
- William Kenneth Marshall (*Applied Physics*) B.S., California Institute of Technology 1981; M.S., University of California, Berkeley 1982.
- Sara Hanley Fagerson McGill (*Geology*) A.B., Harvard College and Radcliffe College 1985.
- Rusty Scott Miskovish (*Mechanical Engineering*) B.S., California Institute of Technology 1988.
- Kikuo Morishita (*Electrical Engineering*) B.S., The National Defense Academy 1984.
- Christine Marie Nelson (*Environmental Engineering Science*) B.S., Trinity University 1988.
- Maisy Mun Lan Ng (*Electrical Engineering*) B.A.Sc., University of Toronto 1988.
- Jeffrey Hung-Phi Nguyen (*Physics*) B.S., California Institute of Technology 1989.
- Flavio Noca (*Aeronautics*) B.S., California Institute of Technology 1988.
- James K. Okamoto (*Applied Physics*) B.S., California Institute of Technology 1988.
- Thomas Germano O'Neill (*Physics*) A.B., University of California, Berkeley 1986.
- Hao Ouyang (*Materials Science*) B.S., National Tsing Hua University 1985.
- David Anthony Pearson (*Electrical Engineering*) B.S., University of California, Berkeley 1988.
- Srinivas Peeta (*Civil Engineering*) B.Tech., Indian Institute of Technology, Madras 1988.
- Girish Jagdish Pendse (*Chemical Engineering*) B.Tech., Indian Institute of Technology, Bombay 1987.
- Jason Kendrick Perry (*Chemistry*) B.A., Johns Hopkins University 1987.
- Donald Anthony Peter (*Mechanical Engineering*) B.S., California State University, Long Beach 1986.
- Kenneth Jerome Peters (*Electrical Engineering*) B.S., University of Rochester 1987.
- Thai Ngoc Pham (*Aeronautics*) B.S., California Institute of Technology 1988.
- Thu Pham (*Chemical Engineering*) B.S., The University of Texas at Austin 1985.
- Scott Miller Phelps (*Geophysics*) B.S., New Mexico Institute of Mining and Technology 1985.
- Mark Clyde Phillips (*Physics*) B.S., University of Kansas 1987.
- George Herbert Pitt III (*Electrical Engineering*) B.S., California Institute of Technology 1984.
- Jean-Marc Prieur (*Electrical Engineering*) Diplôme d'Ingénieur, École Supérieure d'Electricité 1988.
- Sudhendu Rai (*Mechanical Engineering*) B.Tech., Indian Institute of Technology, Kanpur 1988.
- Subrata Rakshit (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Bombay 1988.

MASTER OF SCIENCE—Continued

- Stuart Alexander Ridgway (*Physics*) A.B., University of California, Berkeley 1986.
- Stephen Keith Robinett (*Civil Engineering*) B.S., Loyola Marymount University 1983.
- Wolfgang Fritz Rogge (*Environmental Engineering Science*) Diplom-Ingenieur, Technische Universität Berlin 1986.
- Linda Rose Rowan (*Geology*) B.S. (Geology), University of Illinois at Urbana-Champaign 1986; B.S. (Mathematics), 1986; B.S. (Computer Science), 1986.
- David Wayne Ruff (*Biology*) B.S., University of California, Riverside 1983.
- James Henderson Sabry (*Biology*) M.D., Queens University at Kingston 1983.
- Michelle Louise Santee (*Planetary Science*) B.S., Cornell University 1982; M.S., The University of Texas at Austin 1984.
- Enrico Santi (*Electrical Engineering*) Laurea, Università Degli Studi Di Padova 1988.
- Takeshi Sasaki (*Electrical Engineering*) B.Eng., University of Tokyo 1983.
- Christoph Schmidhuber (*Physics*) Vordiplom, Universität München 1986.
- George Anthony Searle (*Applied Mechanics*) B.S., Purdue University 1986.
- Jeremy David Semrau (*Environmental Engineering Science*) B.S., The University of Texas at Austin 1988.
- Craig Michael Shakarji (*Applied Mathematics*) B.S., University of Maryland at College Park 1987.
- Tiger Tejpal Singh (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Kharagpur 1988.
- Christopher Neil Sipes (*Chemistry*) A.B., Harvard University 1986.
- Man-hung Siu (*Electrical Engineering*) B.Sc., Boston University 1988.
- Steven G. Sogo (*Chemistry*) B.S., University of California, Berkeley 1984.
- Jeffrey John Steele (*Physics*) B.A. (Physics), Rice University 1986; B.A. (Mathematics), 1986.
- Ljubiša Dragoljub Stevanović (*Electrical Engineering*) B.S., Belgrade University 1988.
- Stephen Meng Su (*Electrical Engineering*) B.S., University of California, Berkeley 1988.
- Pieter Johan Swart (*Applied Mathematics*) B.Sc., Universiteit van Pretoria 1983; B.Sc., Honors, 1984; M.Sc., 1986.
- Seen-Liang Thong (*Electrical Engineering*) B.S., California Institute of Technology 1988.
- José Andrés Tierno (*Electrical Engineering*) Ingeniero Industrial-Opción Electrónica, Universidad de la Republica 1987.
- Nancy Susanne Demcak Totten (*Chemistry*) A.B., Bowdoin College 1986.
- Cho-Jen Tsai (*Materials Science*) B.S., National Tsing Hua University 1984.

MASTER OF SCIENCE—Continued

- Michael Alan Udell (*Social Science*) B.A., University of Pennsylvania 1980; M.A., 1982.
- Johann Christiaan Van Der Walt (*Electrical Engineering*) B.Eng., University of Stellenbosch 1980; B.Eng., Honors, 1981; M.Eng., 1986.
- Gregoire Jean Veber (*Aeronautics*) Diplôme d'Ingenieur, Ecole Centrale de Paris 1988.
- Guillaume Vendroux (*Aeronautics*) Diplome d'Ingenieur, Ecole Superieure D'Ingenieurs De Marseille 1988.
- Truong-Son Vinh (*Aeronautics*) B.S., University of California, San Diego 1988.
- Steven David Warwick (*Electrical Engineering*) B.S., University of California, Berkeley 1981.
- Frank Headman Webb (*Geology*) B.A., University of California, Santa Barbara 1984.
- Chih-yung Wen (*Aeronautics*) B.S., National Taiwan University 1986.
- Stephen Noel Winters-Hilt (*Applied Physics*) B.S., California Institute of Technology 1987.
- Denise Lynne Worthen (*Chemistry*) B.S., The University of New Mexico 1984.
- Robert Wynands (*Applied Physics*) Diplom-Vorprüfung, Rheinisch-Westfälische Technische Hochschule Aachen 1984; Diplom-Physiker, 1988.
- Howell Stephen Yee (*Environmental Engineering Science*) Sc.B., Brown University 1987.
- Sin-Nim Samuel Yip (*Physics*) B.A., Oxford University 1987.
- Joanne Yoshimura (*Geophysics*) B.S., Stanford University 1985.
- Jack Yuan (*Electrical Engineering*) B.E., Stevens Institute of Technology 1988.
- Qing Zhu (*Civil Engineering*) B.Eng., East China Technical University of Water Resources 1982; M.Eng., 1984.
- Theodore Peter Zoli (*Civil Engineering*) B.S.E., Princeton University 1988.

ENGINEER

- Kurt Arthur Andrews (*Mechanical Engineer*) B.S., United States Military Academy 1977; M.S., California Institute of Technology 1989.
- Fei Zhuang (*Mechanical Engineer*) M.S., Beijing Institute of Aeronautics and Astronautics 1984.

DOCTOR OF PHILOSOPHY

DIVISION OF BIOLOGY

- Kurt Andrew Eakle (*Biology*) B.S., University of Wisconsin-Madison 1979.
Thesis: Characterization of the SEC 18 Gene of *S. cerevisiae*: Identification of a Protein Involved in Yeast Secretion.
- Young Shin Lim Hahn (*Biology*) B.S., Yon Sei University 1983.
Thesis: Functional Analysis of Viral Nonstructural and Structural Proteins.
- Jennifer Normanly (*Biology*) B.A., University of California, Santa Cruz 1983.
Thesis: An *in vivo* Approach to tRNA Identity.
- Patricia Jean Renfranz (*Biology*) B.S., Purdue University 1983.
Thesis: Molecular Neurogenetics of Eye Development in *Drosophila*.
- Dave William Sivertsen (*Neurobiology*) B.S., California Institute of Technology 1979.
Thesis: The Physiology of High Order Visual Neurons in the Jumping Spider (Salticidae) and the Vocalizations of Free Ranging Owl Monkeys.
- Henry Michael Sucov (*Biology*) B.A., Oberlin College 1981.
Thesis: Characterization and Developmental Regulation of a Gene Expressed Specifically in the Skeletogenic Lineage of the Sea Urchin Embryo.
- Usha Vijayraghavan (*Biology*) B.Sc., University of Delhi 1980; M.Sc., Post Graduate Institute of Medical Education and Research, Chandigarh 1984.
Thesis: A Genetic and Biochemical Analysis of pre-mRNA Splicing in *Saccharomyces cerevisiae*.

DIVISION OF CHEMISTRY AND CHEMICAL ENGINEERING

- Emilio Enrique Bunel (*Chemistry*) B.S., University of Chile 1980.
Thesis: Synthetic and Mechanistic Studies of Organoscandium Compounds. Dimerization and Branching of Alkenes Catalyzed by Scandocene Hydrides.
- Richard Dale Colberg (*Chemical Engineering*) B.S., Auburn University 1980.
M.S., 1982.
Thesis: Area, Cost and Resilience Targets for Heat Exchanger Networks.
- Frank D. Coms (*Chemistry*) B.S., University of Washington 1983.
Thesis: Synthesis, Spectroscopy and Reactivity of Phenyl-Substituted 1,3-Biradicals.
- David Vernell Dearden (*Chemistry*) B.S., Brigham Young University 1983.
Thesis: Experimental Probes of Gas Phase Ions and Molecules: I. Product Kinetic Energy Release Measurements as a Probe of Reaction Thermochemistry, Dynamics, and Chemical Structure in Systems Containing Transition Metal Ions.
II. Photoelectron and Optical Studies of Organic Transient Species.

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*

- Ardith El-Kareh (*Chemical Engineering*) B.S., University of Colorado 1982.
Thesis: 1. On a New Constitutive Equation for Non-Newtonian Fluids. 2. Brownian Motion with Fluid-Fluid Interfaces.
- Lucius Seiberling Fox (*Chemistry*) B.S., Ohio State University 1983.
Thesis: Intramolecular Electron Transfer in an Iridium d⁸-d⁸ Donor-Acceptor System.
- Jorge Luis Galazzo (*Chemical Engineering and Biology*) Chem.Eng., National University of the Litoral 1980; M.S., California Institute of Technology 1986.
Thesis: Effects of Cell Entrapment in Ca-alginate on the Metabolism of Yeast *Saccharomyces cerevisiae*.
- Tracy Marie Handel (*Chemistry*) B.S., Bucknell University 1980.
Thesis: Disulfide Polymerizable Phosphatidylcholines; Characterization of Membrane Physical Properties and Investigations of *in vivo* Behavior.
- Keith Duncan Harshman (*Chemistry*) B.A., Lake Forest College 1980.
Thesis: Isolation and Characterization of Factors that Interact with Eukaryotic Transcriptional Enhancers.
- William Joseph Healey (*Chemistry*) B.S., The Pennsylvania State University 1983.
Thesis: The Structural Basis of Enzyme Catalysis: Mutagenesis of β -lactamase at Ala 172, Glu 166 and Ala 237.
- Katherine J. Kanes (*Chemistry*) A.B., Bryn Mawr College 1983.
Thesis: Band 3 Structure and Function: ³⁷Cl NMR and Topographical Investigations.
- Jennifer Lynn Karas (*Chemistry*) B.A., Amherst College 1984.
Thesis: Long-Range Electron Transfer in Ruthenium-Labelled Myoglobin.
- Floyd L. Klavetter (*Chemistry*) B.S., University of Missouri, Rolla 1985.
Thesis: Polyacetylene and Novel Conjugated Derivatives through the Metathesis Polymerization of 1,3,5,7-Cyclooctatetraenes.
- Claudius Kormann (*Chemistry*) Diplom-Vorprüfung, Technische Universität Berlin 1982; De La Licence, Université Claude Bernard-Lyon 1983; Diplom, Eidgenössische Technische Hochschule Zürich 1985.
Thesis: Synthesis and Characterization of Quantum Size Metal Oxide Colloidal Particles. Photocatalytic Peroxide Formation on ZnO and TiO₂.
- Sonia Maria Kreidenweis-Dandy (*Chemical Engineering*) B.E., Manhattan College 1983; M.S., California Institute of Technology 1985.
Thesis: Experimental and Theoretical Studies of Binary Nucleation and Condensation.
- Doreen Ma (*Chemistry*) B.S., The Pennsylvania State University 1983.
Thesis: I. Regulatory Elements in ColE1 DNA Replication in *Escherichia coli*.
II. Mutants of *Saccharomyces cerevisiae* DNA Polymerase I Resistant to Nucleotide Analogs: dNTP Binding Site Definition.
- Anne T. McQueen (*Chemical Engineering and Biology*) B.Eng., McGill University 1983; M.S., California Institute of Technology 1987.
Thesis: Ammonium Ion Effects on Hybridoma Cell Physiology.

DOCTOR OF PHILOSOPHY — *Continued*

David Mendel (*Chemistry*) B.A., Carlton College 1983.

Thesis: Chemical and Enzymatic Footprinting of Quinoxaline Antibiotics on DNA.

Joel Edgar Morgan (*Chemistry*) B.S., Baylor University 1980.

Thesis: Electron Transfer in Cytochrome *c* Oxidase: The Rate of Electron Equilibration between Cytochrome *a* and Copper A.

Suk Woo Nam (*Chemical Engineering*) B.S., Seoul National University 1982; M.S., 1984.

Thesis: Oxidative Chemisorption of SO₂ on γ -Al₂O₃ and Deposition of H₂-Permsselective SiO₂ Films.

Adel Marie Naylor (*Chemistry*) B.A., Northwestern University 1980; M.S., Indiana University-Purdue University at Indianapolis 1984.

Thesis: Insights on Enzymes and Polymers from Molecular Dynamics Simulations: Application to Dihydrofolate Reductase Complexes and Starburst Dendrimers.

Bruce M. Novak (*Chemistry*) B.S., California State University, Northridge 1981; M.S., 1985.

Thesis: Aqueous Ring-Opening Metathesis Polymerizations.

Joon Won Park (*Chemistry*) B.A., Sogang University 1979; M.S., Korea Advanced Institute of Science and Technology 1981.

Thesis: Reactivity of Titanocene Methylidene with Metal Halides, Alkene Sulfides, and Alkene Oxides.

Valerie Patrick (*Chemical Engineering*) B.S., Bucknell University 1984; M.S., California Institute of Technology 1987.

Thesis: Synthesis, Characterization, and Kinetics of Mixed Copper-Aluminum and Iron-Aluminum Oxides for High-Temperature Desulfurization.

Julianto Pranata (*Chemistry*) B.A., Oberlin College 1984.

Thesis: Theoretical Studies of Novel Organic Systems: Biradicals, Polyradicals and Conducting Polymers.

Todd Michael Przybycien (*Chemical Engineering and Biology*) B.S., Washington University 1984; M.S., California Institute of Technology 1986.

Thesis: Structure, Function and Aggregation Kinetics in Salt-Induced Protein Precipitation.

Henrik Rudolph (*Chemistry*) Cand. Scient., University of Copenhagen 1984.

Thesis: Dynamics of Rotationally Resolved Multiphoton Ionization Processes in Molecules.

Norbert Franz Scherer (*Chemistry*) S.B., University of Chicago 1982.

Thesis: Time-Resolved Studies of Molecular Reaction Dynamics and Development of Experimental Methodology.

Mary Selman (*Chemistry*) B.A., Douglass College-Rutgers University 1982.

Thesis: Preparation and Characterization of and Intramolecular Electron Transfer in a Pentaammineruthenium Derivative of *Candida krusei* Cytochrome *c*.

DOCTOR OF PHILOSOPHY—Continued

- Jacqueline Vanni Shanks (*Chemical Engineering*) B.S., Iowa State University 1983.
Thesis: Metabolic Engineering Applications of *in vivo* ^{31}P and ^{13}C NMR Studies of *Saccharomyces cerevisiae*.
- Seung Koo Shin (*Chemistry*) B.S., Seoul National University 1980; M.S., 1984.
Thesis: Experimental and Theoretical Studies of Silylenes, Silicene Ions and Organometallic Reactive Intermediates.
- David Charles Smith (*Chemistry*) B.S., University of California, Berkeley 1983.
Thesis: Electronic Structure and Photochemical Reactivity of Binuclear Metal Complexes.
- Cynthia Strong St. Clair (*Chemistry*) B.A., Whitman College 1982.
Thesis: Electrochemical and Electron Transfer Investigations of Copper Proteins.
- Martin A. St. Clair (*Chemistry*) B.S., Butler University 1983.
Thesis: Synthetic and Structural Studies of Permethylscandocene and Permethyltantalocene Derivatives.
- David Alan Stauffer (*Chemistry*) B.S., The Pennsylvania State University 1983; M.S., 1983.
Thesis: The Ion-Dipole Effect is a Force for Molecular Recognition and Biomimetic Catalysis.
- Kevin Scot Sweder (*Chemistry*) B.A., University of Colorado, Boulder 1980.
Thesis: Isolation and Characterization of Proteins that Bind to Yeast Origins of DNA Replication.
- H. Holden Thorp (*Chemistry*) B.S., University of North Carolina, Chapel Hill 1986.
Thesis: The Photochemistry of Dioxorhenium(V).
- Mark S. Trimmer (*Chemistry*) B.S., The Pennsylvania State University 1983.
Thesis: Mechanistic and Reactivity Studies of Bent Metallocene Complexes of Niobium and Tantalum.
- Nancy Swick Vogelaar (*Chemistry*) B.S., University of Delaware 1982.
Thesis: Structural and Mechanistic Motifs in Membrane Proteins.
- Warren Stanfield Wade (*Chemistry*) A.B., Cornell University 1983.
Thesis: Sequence Specific Complexation of B DNA at Sites Containing G,C Base Pairs.
- Nam Sun Wang (*Chemical Engineering*) B.S., University of California, Berkeley 1979; M.S., California Institute of Technology 1982.
Thesis: Mathematical and Experimental Studies of Microbial Processes with Lag Effects.
- Paula I. Watnick (*Chemistry*) A.B., Princeton University 1982.
Thesis: Cooperative Properties of Lipid Bilayers: Collective Director Fluctuations and the Effects of Hydrophobic Mismatch in Protein/Lipid Membrane Systems.
- Karl Dane Wittrup (*Chemical Engineering and Biology*) B.S.Ch.E., University of New Mexico 1984; M.S., California Institute of Technology 1986.
Thesis: Plasmid Propagation in the Yeast *Saccharomyces cerevisiae*: Flow Cytometry Studies and Segregated Modeling.

DOCTOR OF PHILOSOPHY — *Continued*

Isaac de Melo Xavier, Junior (*Chemistry*) Eng., Universidade Federal de Pernambuco 1977; M.Sc., 1981.

Thesis: Electron Energy-Loss Spectroscopy Study of Polyatomic Molecular Systems under Pyrolytic Conditions.

Miriam Heinrichs Zietlow (*Chemistry*) B.S., University of North Carolina, Chapel Hill 1983.

Thesis: Chemistry of Low-Valent Platinum Dimers.

DIVISION OF ENGINEERING AND APPLIED SCIENCE

Hojin Ahn (*Mechanical Engineering*) B.S., California Institute of Technology 1985; M.S., 1986.

Thesis: Experimental and Analytical Investigations of Granular Materials: Shear Flow and Convective Heat Transfer.

A. V. Anilkumar (*Mechanical Engineering and Aeronautics*) B.Tech., Indian Institute of Technology, Madras 1982; M.S., California Institute of Technology 1983.

Thesis: Experimental Studies of High-Speed Dense Dusty Gases.

Philip Stewart Beran (*Aeronautics*) B.S., Cornell University 1982; M.S., California Institute of Technology 1983.

Thesis: An Investigation of the Bursting of Trailing Vortices Using Numerical Simulation.

Martin Brouillette (*Aeronautics*) B.Eng., McGill University 1984; M.S., California Institute of Technology 1985.

Thesis: On the Interaction of Shock Waves with Contact Surfaces Between Gases of Different Densities.

Chi-Chao Chao (*Electrical Engineering*) B.S., National Taiwan University 1983; M.S., California Institute of Technology 1986.

Thesis: Error-Correction Coding for Reliable Communication in the Presence of Extreme Noise.

Tzi-Dar Chiueh (*Electrical Engineering*) B.S., National Taiwan University 1983; M.S., California Institute of Technology 1986.

Thesis: Pattern Classification and Associative Recall by Neural Networks.

David Hsingkuo Chow (*Applied Physics*) B.S., Case Western Reserve University 1984; M.S., California Institute of Technology 1986.

Thesis: Growth, Characterization, and Simulation of Novel Semiconductor Tunnel Structures.

John Timothy Coffey (*Electrical Engineering*) B.E., University College Dublin 1985; M.S., California Institute of Technology 1986.

Thesis: On the Complexity and Efficiency of Encoding and Decoding Error-Correcting Codes.

DOCTOR OF PHILOSOPHY—*Continued*

- Jeffrey Lee Collett, Jr. (*Environmental Engineering Science and Economics*) S.B., Massachusetts Institute of Technology 1984; M.S., California Institute of Technology 1985.
Thesis: Characterization of Cloudwater and Precipitation Chemistry and Deposition at Elevated Sites in Central and Southern California.
- Oliver Michael Collins (*Electrical Engineering*) B.S., California Institute of Technology 1986; M.S., 1987.
Thesis: Coding Beyond the Computational Cutoff Rate.
- Pamela L. Derry (*Applied Physics*) B.S., Rensselaer Polytechnic Institute 1983; M.S., California Institute of Technology 1985.
Thesis: Properties of Buried Heterostructure Single Quantum Well (Al,Ga) as Lasers.
- Thomas J. DiChristina (*Environmental Engineering Science*) B.S., University of Rochester 1982; M.S., California Institute of Technology 1983.
Thesis: Dissimilative Iron Reduction by *Alteromonas putrefaciens* Strain 200.
- William Patrick Donlon, Jr. (*Civil Engineering*) B.S., University of Notre Dame 1982; M.S., California Institute of Technology 1983.
Thesis: Experimental Investigation of the Nonlinear Seismic Response of Concrete Gravity Dams.
- Bahaa M. El-Aidi (*Civil Engineering*) B.Sc., Cairo University 1978; M.S., California Institute of Technology 1983.
Thesis: Nonlinear Earthquake Response of Concrete Gravity Dam Systems.
- Ronald John Franz (*Mechanical Engineering and Applied Physics*) B.S., California Institute of Technology 1982; M.S., 1983.
Thesis: Experimental Investigation of the Effect of Cavitation on the Rotordynamic Forces on a Whirling Centrifugal Pump Impeller.
- David Earl James (*Environmental Engineering Science and Oceanography*) A.B., University of California, Davis 1975; M.S., California Institute of Technology 1983.
Thesis: Effects of Hydrazine and Other Toxicants on Early Life Stages of California Brown Algae.
- Matthew Bruce Johnson (*Applied Physics*) B.Sc., University of Waterloo 1979.
Thesis: Ultrafast Time-Resolved Photoluminescence Studies of GaAs.
- Todd Jarrott Jones (*Applied Physics*) B.S., Harvey Mudd College 1981; M.S., California Institute of Technology 1984.
Thesis: Radiation Induced Conductivity in Amorphous Carbon.
- Sridhar Krishnaswamy (*Aeronautics and Materials Science*) B.Tech., Indian Institute of Technology, Madras 1983; M.S., California Institute of Technology 1984.
Thesis: On the Domain of Dominance of the Asymptotic Elastodynamic Crack-Tip Fields.

DOCTOR OF PHILOSOPHY — *Continued*

- Davy Lo (*Applied Physics*) B.S., University of California, Irvine 1982; M.S., California Institute of Technology 1984.
Thesis: Molecular Dynamics Simulations of Sputtering.
- Lun-Tseng Lu (*Applied Physics*) B.S., National Central University 1975; M.S., Iowa State University 1981.
Thesis: Dynamics, Noise Properties, and Spectral Characteristics of Semiconductor Lasers with External Coupling.
- Roya Maboudian (*Applied Physics*) B.E.E., Catholic University of America 1982; M.S., California Institute of Technology 1985.
Thesis: In-Situ Observation of Surface and Near Surface Modification Using the Scattering of Ballistic Phonons.
- Mary Ann Cecilia Maher (*Computer Science*) B.S., The Pennsylvania State University 1982.
Thesis: Charge Controlled Modeling of the MOS Transistor.
- Dragan Maksimović (*Electrical Engineering*) B.S., University of Belgrade 1984; M.S., California Institute of Technology 1987.
Thesis: Synthesis of PWM and Quasi-Resonant DC-to-DC Power Converters.
- Jon Mearns McChesney (*Applied Physics*) B.Sc., University of Natal 1979; M.Sc., 1983; M.S., California Institute of Technology 1984.
Thesis: Observations of Stochastic Ion Heating by Low Frequency Drift Waves.
- Richard Henry Miles (*Applied Physics*) B.S., California Institute of Technology 1983.
Thesis: Structural and Optical Properties of Strained-Layer Superlattices.
- Michael Mittelstein (*Applied Physics*) Vordiplom Physik, Universität Hamburg 1977; Vordiplom Informatik 1977; Diplom Physik 1983.
Thesis: Theory and Experiments on Unstable Resonator and Quantum Well GaAs/GaAlAs Lasers.
- Fai Ho Mok (*Electrical Engineering*) B.S., The City College of the City University of New York 1981; M.S., California Institute of Technology 1982.
Thesis: Binary Correlators for Optical Computing and Pattern Recognition.
- James William Munger (*Environmental Engineering Science and Planetary Science*) B.S., University of Minnesota 1976; M.S., 1981.
Thesis: The Chemical Composition of Fogs and Clouds in Southern California.
- William W. Nazaroff (*Environmental Engineering Science*) A.B., University of California, Berkeley 1978; M.Eng., 1980.
Thesis: Mathematical Modeling and Control of Pollutant Dynamics in Indoor Air.
- John Yee-Keung Ngai (*Computer Science*) B.S., California Institute of Technology 1982; M.S., 1984.
Thesis: A Framework for Adaptive Routing in Multicomputer Networks.
- Truong Quang Nguyen (*Electrical Engineering*) B.S., California Institute of Technology 1985; M.S., 1986.
Thesis: Design and Implementation of Linear-Phase and/or Pairwise Symmetric Perfect-Reconstruction Fir Multirate Digital Filter Banks.

DOCTOR OF PHILOSOPHY—*Continued*

- Paul Scott Nowak (*Applied Mechanics*) B.S., State University of New York 1980; M.S., University of Illinois at Urbana-Champaign 1981.
Thesis: Effect of Nonuniform Seismic Input on Arch Dams.
- John C. Platt (*Computer Science*) B.S., California State University, Long Beach 1982; M.S., California Institute of Technology 1985.
Thesis: Constraint Methods for Neural Networks and Computer Graphics.
- Marco Rasi (*Civil Engineering*) Ingegneria Civil-Sezione Idraulica, Università Degli Studi di Pisa 1984; M.S., California Institute of Technology 1986.
Thesis: Mixing in Density-Stratified Conjugate Flows.
- Vered Rom-Kedar (*Applied Mathematics*) B.Sc., Technion-Israel Institute of Technology 1983.
Thesis: Part I: An Analytical Study of Transport, Mixing and Chaos in an Unsteady Vortical Flow. Part II: Particle Transport in Two-Dimensional Maps.
- Phoebus Rosakis (*Applied Mechanics*) B.Sc., Brown University 1983; M.S., California Institute of Technology 1984.
Thesis: Ellipticity and Deformations with Discontinuous Gradients in Finite Elastostatics.
- James Michael Rotenberg (*Applied Mathematics*) B.A., Rice University 1976; M.A., The University of Texas at Austin 1981.
Thesis: Effect of Compliant Boundaries on Weakly Nonlinear Shear Waves in Channel Flow.
- Ricardo Salvador Sánchez Peña (*Electrical Engineering*) Ingeniería Electromecánica, Universidad de Buenos Aires 1979; M.S., California Institute of Technology 1986.
Thesis: Robust Analysis of Feedback Systems with Parametric and Dynamic Structured Uncertainty.
- Mark Alan Schalit (*Applied Physics*) A.B., Occidental College 1981; M.S., California Institute of Technology 1985.
Thesis: Oscillating-Field Current-Drive Schemes for Tokamaks.
- Steven Philip Schneider (*Aeronautics*) B.S., California Institute of Technology 1981; M.S., 1984.
Thesis: Effects of Controlled Three-Dimensional Perturbations on Boundary Layer Transition.
- Israel Soibelman (*Applied Mathematics*) B.S., Columbia University 1983; M.S., California Institute of Technology 1984.
Thesis: A Study of Finite Amplitude Bifurcations in Plane Poiseuille Flow.
- Francis Chi Kin Ting (*Civil Engineering*) B.Sc., The University of Manchester Institute of Science and Technology 1982; M.S., California Institute of Technology 1983.
Thesis: Interaction of Water Waves with a Density Stratified Fluid in a Rectangular Trench.

DOCTOR OF PHILOSOPHY — *Continued*

- Yasuo Tomita (*Electrical Engineering*) B.S., Hokkaido University 1978; M.S., 1980; M.S., California Institute of Technology 1986.
Thesis: Modal Dispersal of Information and Wave Mixing in Photorefractive Crystals for Information Retrieval, Processing and Sensing.
- Brian Von Herzen (*Computer Science and Planetary Science*) A.B., Princeton University 1980; M.S., California Institute of Technology 1986.
Thesis: Applications of Surface Networks to Sampling Problems in Computer Graphics.
- Wyman Lee Williams (*Electrical Engineering*) B.S., Rose-Hulman Institute of Technology 1980; S.M., Massachusetts Institute of Technology 1982.
Thesis: Computer-Aided Measurement of Microwave Circuits.
- Grégoire Stéphane Winckelmans (*Aeronautics*) Ingénieur Civil Mécanicien, Université Catholique de Louvain 1983; M.S., California Institute of Technology 1985.
Thesis: Topics in Vortex Methods for the Computation of Three- and Two-Dimensional Incompressible Unsteady Flows.

DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES

- Marcus Ivan Bursik (*Geology*) B.A., California State University, Fresno 1981; M.S., California Institute of Technology 1982.
Thesis: Late Quaternary Volcano-Tectonic Evolution of the Mono Basin, Eastern California.
- Timothy Edward Dowling (*Planetary Science*) B.S., University of Virginia 1984.
Thesis: A Dynamical Study of Jupiter's Great Red Spot.
- Kenneth Edward Herkenhoff (*Planetary Science and Geology*) A.B., University of California, Berkeley 1981; M.S., California Institute of Technology 1985.
Thesis: Quantitative Studies of the Martian South Polar Region Using Spacecraft Images.
- Kevin A. Maher (*Geology*) B.S., State University of New York at Albany 1980. M.S., University of Wisconsin-Madison 1982.
Thesis: Geology of the Jackson Mountains, Northwest Nevada.
- Diane Vera Michelangeli (*Planetary Science and Geochemistry*) B.Sc., McGill University 1983; M.S., California Institute of Technology 1985.
Thesis: I. Impact of Volcanic Aerosols on Stratospheric Chemistry. II. $O_2(^1\Sigma_g^+)$ and $O_2(^1\Delta_g)$ in the $H + O_2$ Reaction System. III. Barotropic Instability of Zonal Jets on Mars, Earth and Venus.
- Oded Navon (*Geology*) B.Sc., The Hebrew University of Jerusalem 1977; M.Sc., 1982.
Thesis: Chemical and Mineralogical Characterization of Micro-Inclusions in Diamonds.

DOCTOR OF PHILOSOPHY — *Continued*

- Jonathan Alan Nourse (*Geology*) B.S., Colorado School of Mines 1983; M.S., California Institute of Technology 1986.
Thesis: Geological Evolution of Two Crustal Scale Shear Zones; Part I: The Rand Thrust Complex, Northwestern Mojave Desert, California. Part II: The Magdalena Metamorphic Core Complex, North Central Sonora, Mexico.
- Carol Ann Polanskey (*Planetary Science and Geophysics*) B.S., The Pennsylvania State University 1982; M.S., California Institute of Technology 1984.
Thesis: I. Impact Spallation Experiments: Fracture Patterns and Spall Velocities. II. Craters in Carbonate Rocks: An Electron Paramagnetic Resonance Analysis of Shock Damage.
- Carol Seabury Prentice (*Geology*) B.A., Humboldt State University 1979; M.S., California Institute of Technology 1984.
Thesis: Earthquake Geology of The Northern San Andreas Fault Near Point Arena, California.
- Stephen Lowell Salyards (*Geophysics and Geology*) B.S., The Pennsylvania State University 1982; M.S., California Institute of Technology 1983.
Thesis: Dating and Characterizing Late Holocene Earthquakes Using Paleomagnetism.
- George Cleve Solomon (*Geology*) B.A., University of California, Santa Barbara 1974; M.Sc., The Pennsylvania State University 1978.
Thesis: An $^{18}\text{O}/^{16}\text{O}$ Study of Mesozoic and Early Tertiary Granitic Batholiths of the Southwestern North American Cordillera.

DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

- Patrick Legros (*Social Science*) Maitrise, Université Paris XII 1979; D.E.A., 1981; Doctorat, 1985; M.S., California Institute of Technology 1988.
Thesis: Efficiency and Stability in Partnerships.
- Jonathan Nagler (*Social Science*) A.B., Harvard College 1982; M.S., California Institute of Technology 1985.
Thesis: An Examination of Strategic Opportunities Provided by the Conference Committee Procedure in the U.S. Congress.
- William Manson Pegram (*Social Science*) B.A., Stanford University 1973; M.B.A., 1977; M.S., California Institute of Technology 1985.
Thesis: The Federal Photovoltaics Commercialization Program.

DIVISION OF PHYSICS, MATHEMATICS AND ASTRONOMY

- Mary Anne Barsony (*Physics*) B.A., University of California, Berkeley 1976; S.B., Massachusetts Institute of Technology 1982; M.S., California Institute of Technology 1984.
Thesis: Outflows in High Mass Star-Forming Regions.

DOCTOR OF PHILOSOPHY — *Continued*

- Sean Macauley Callahan (*Physics*) B.S., University of Washington 1983; M.S., California Institute of Technology 1985.
Thesis: Exchange Interactions in Solid ^3He on a Parallel Computer.
- Eric Richard Christian (*Physics*) B.A., The University of Pennsylvania 1982; M.S., California Institute of Technology 1985.
Thesis: Evidence for Anomalous Cosmic Ray Hydrogen.
- Renato Feres (*Mathematics*) B.S., Universidade Estadual de Campinas 1983; M.S., 1985.
Thesis: Geodesic Flows on Manifolds of Negative Curvature with Smooth Horospheric Foliations.
- Jon Eric Grove (*Physics*) A.B., University of California, Berkeley 1982; M.S., California Institute of Technology 1984.
Thesis: A Balloon Measurement of the Isotopic Composition of Galactic Cosmic Ray Iron.
- Gary Michael Gutt (*Physics and Computer Science*) B.S., University of Notre Dame 1974; M.S., Arizona State University 1977.
Thesis: The Physics of Granular Systems.
- Boris Hasselblatt (*Mathematics*) Diplom-Vorprüfung, Technische Universität Berlin 1981.
Thesis: Regularity of the Anosov Splitting and a New Description of the Margulis Measure.
- Kai Hauser (*Mathematics*) M.S., University of Heidelberg 1985.
Thesis: Independence Results for Indescribable Cardinals.
- Christopher Sharpe Kochanek (*Physics*) B.A., Cornell University 1985.
Thesis: Studies in Gravitational Lensing and Numerical Hydrodynamics.
- John Florian Lindner (*Physics*) B.S., University of Vermont 1982.
Thesis: Spectral Gaps from Ordered to Disordered Systems.
- Mark Raphael Muldoon (*Physics*) B.A., Northwestern University 1981.
Thesis: Ghosts of Order on the Frontier of Chaos.
- Tadashi Nakajima (*Physics*) B.S., Kyoto University 1982; M.S., 1984.
Thesis: Diffraction-Limited Imaging on the 200-inch Telescope.
- Bridget Mary Geraldine O'Callaghan-Hay (*Physics*) B.Sc., University College Cork 1981; M.Sc., 1983; M.S., California Institute of Technology 1985.
Thesis: A High Pressure Xenon Time Projection Chamber for Double Beta Decay.
- David Henry Potterveld (*Physics*) B.S., Harvey Mudd College 1981.
Thesis: A Measurement of Inclusive Quasi-Elastic Electron Scattering Cross Sections at High Momentum Transfer.
- Maria Elena Verona (*Mathematics*) M.S., University of Bucharest 1973.
Thesis: Generic Differentiability of Convex Functions and Monotone Operators.

DOCTOR OF PHILOSOPHY — *Continued*

Robert Bruce Vogelaar (*Physics*) B.S., Hope College 1982; M.S., California Institute of Technology 1984.

Thesis: The $^{26}\text{Al}(p,\gamma)^{27}\text{Si}$ Reaction: Stellar Origins of Galactic ^{26}Al .

Robert Christian David Walker (*Physics*) B.S., University of Wisconsin-Madison 1984; M.S., California Institute of Technology 1985.

Thesis: A Measurement of the Proton Elastic Form Factors for $1 \leq Q^2 \leq 3$ (GeV/c) 2 .

Duncan Lee Weathers (*Physics*) B.S., University of Missouri-Columbia 1983.

Thesis: Sputtering by Multiply-Charged Ions, and Preferential Sputtering of Isotopic Mixtures.

Ulvi Yurtsever (*Physics*) B.Sc., Middle East Technical University 1983.

Thesis: Singularities and Horizons in the Collisions of Gravitational Waves.

Yanong Zhu (*Physics*) B.A., University of California, Santa Cruz 1982.

Thesis: The Decay Properties of the ψ (3770).

Michael Edward Zucker (*Physics*) B.S., University of Rochester 1983; M.S., California Institute of Technology 1985.

Thesis: Experiments with a Laser Interferometric Gravitational Wave Antenna.

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.

Grégoire S. Winckelmans

MABEL BECKMAN PRIZE

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

Julie Ann Sheridan

ERIC TEMPLE BELL UNDERGRADUATE MATHEMATICS RESEARCH PRIZE

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

James B. Coykendall IV

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

Prizes and awards are listed only for those students awarded degrees in 1989, and include prizes and awards received by them in previous years.

PRIZES AND AWARDS—*Continued*

any other nonacademic criteria. Listed below are graduating seniors who have been recipients of these prizes.

<i>Khurram Khan Afridi</i>	<i>Donald Edwin Finnell</i>	<i>Harvey I-Heng Liu</i>
<i>Ghufran Ahmed</i>	<i>Michael Jon Freeman</i>	<i>Jesús Maíz Apellániz</i>
<i>Babak Ayazifar</i>	<i>José Miguel González</i>	<i>Michael Edward Malcom</i>
<i>Oren Bergman</i>	<i>Yuk Lung Ha</i>	<i>Bassem Nabih Mora</i>
<i>Thomas Robinson Bewley</i>	<i>Imran Kizilbash</i>	<i>Man-Ho Raymond Ngai</i>
<i>Paul Joseph Brewer</i>	<i>Quynh-Thu Xuan Le</i>	<i>Karen Faye Oegema</i>
<i>Cameron Dougall Campbell</i>	<i>Andrew Lee</i>	<i>Daniel Henri Raguin</i>
<i>Peter Dennis Capofreddi</i>	<i>Brian Elliot Lemoff</i>	<i>Julie Ann Sheridan</i>
<i>Stanley F. Chen</i>	<i>Philip Jin-Yi Lin</i>	<i>Dawn Yvonne Sumner</i>
<i>Rachael Ann Clark</i>	<i>Peter Allan Lindstrom, Jr.</i>	<i>Charles Su-Chang Tsai</i>

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.

1988 *Thomas R. Bewley; Peter D. Capofreddi*

DEANS' CUP AND MASTERS' CUP

Two awards, selected by the Deans and Masters respectively, presented to undergraduates whose concern for their fellow students has been demonstrated by persistent efforts to improve the quality of undergraduate life and by effective communication with members of the faculty and administration.

1989 *Seth L. Jelen, Deans' Cup*

1988 *Bibi Jentoft-Nilsen, Masters' Cup*

1989 *Mark D. Rintoul III, 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.

Jennifer Normanly

HAREN LEE FISHER MEMORIAL AWARD IN JUNIOR PHYSICS

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

1988 *José M. González*

PRIZES AND AWARDS—*Continued*

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.

1988 *José M. González*

JACK E. FROELICHI 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.

1988 *Karen F. Oegema*

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.

1988 *Dawn Y. Sumner*

1989 *Rachael A. Clark; Randy S. Levinson*

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.

1987 *Quynh-Thu X. Le*

1988 *Rachael A. Clark*

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.

Harvey I-Heng Liu

THE HERBERT NEWBY McCOY AWARD

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

1988 *Tracy M. Handel*

1989 *Lucius S. Fox, Bruce M. Novak*

PRIZES AND AWARDS—*Continued*

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.

1987 *Samuel P. Weaver*

1989 *Philip Hyonsu Lee, Bradley A. Scott, Tzejen James Shih*

ROBERT L. NOLAND LEADERSHIP SCHOLARSHIP

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

1987 *Samuel P. Weaver*

1989 *James B. Coykendall IV*

THE RODMAN W. PAUL PRIZE

Awarded to a junior who has displayed unusual interest in and talent for history.

Cameron D. Campbell

HERBERT J. RYSER MEMORIAL SCHOLARSHIPS

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

1988 *Stanley F. Chen*

RICHARD P. SCHUSTER MEMORIAL PRIZE

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

1988 *Peter A. Lindstrom; Karen F. Oegema*

1989 *Mihai D. Azimioara; Junko Munakata*

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.

1989 *Sridhar Krishnaswamy*

PRIZES AND AWARDS — *Continued*

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.

1988 Thomas R. Bewley; Dean C. Elzinga

SIGMA XI AWARD

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

Victor J. Chan

CIT ALMA MATER

by Manton Barnes, B.S. '21 E.E., and Dr. Olaf Frodsham, honorary alumnus

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