



*Ninety-Second
Annual Commencement
June 13, 1986*

CALIFORNIA INSTITUTE OF TECHNOLOGY

*Ninety-Second
Annual
Commencement*

FRIDAY MORNING AT TEN O'CLOCK
JUNE THIRTEENTH, NINETEEN EIGHTY-SIX

The Commencement Ceremony

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

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

These gradations and distinctions are reflected in the quaint and colorful niceties of academic dress.

Of particular interest is the cap or mortarboard. In the form of the biretta it was the peculiar sign of the master. Its use has now spread far beyond that highly select group to school boys and choir girls and even to the nursery school. *Sic transit*. . .

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

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

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

David C. Elliot
Professor of History

Academic Procession

Chief Marshal, J. Kent Clark

Assistant Marshals

Christopher E. Brennen, Ph.D. Robert W. Oliver, Ph.D.

Jenijoy La Belle, Ph.D. Ward Whaling, Ph.D.

David S. Wood, Ph.D.

Faculty Officers

B. Vincent McKoy, Ph.D. Eleanor M. Searle, Ph.D., D.M.S.

Ward Whaling, Ph.D.

MARCHING ORDER

CANDIDATES FOR THE DEGREE OF BACHELOR OF SCIENCE

CANDIDATES FOR THE DEGREE OF MASTER OF SCIENCE

CANDIDATES FOR THE DEGREE OF ENGINEER

CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

FACULTY OFFICERS

THE FACULTY

THE CHAIRMEN OF DIVISIONS

THE DEANS

THE PROVOST

THE TRUSTEES

THE COMMENCEMENT CHAPLAIN

THE COMMENCEMENT SPEAKER

THE PRESIDENT

THE CHAIRMAN OF THE BOARD OF TRUSTEES

Program

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

ORGAN PRELUDE Leslie J. Deutsch, Ph.D.

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

INVOCATION The Reverend Norman V. Naylor
Throop Memorial Church

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

MUSICAL SELECTION The Caltech Glee Clubs
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	Gary A. Lorden, Ph.D. <i>Dean of Students</i>
For the Degree of Master of Science	Stirling L. Huntley, Ph.D. <i>Associate Dean of Graduate Studies</i>
For the Degree of Engineer	Arden L. Albee, Ph.D. <i>Dean of Graduate Studies</i>
For the Degree of Doctor of Philosophy	Dr. Albee
Biology	Norman H. Horowitz, Ph.D. <i>Professor of Biology, Emeritus</i>
Chemistry and Chemical Engineering	Fred C. Anson, Ph.D. <i>Division Chairman</i>
Engineering and Applied Science	Paul C. Jennings, Ph.D. <i>Division Chairman</i>
Geological and Planetary Sciences	Peter J. Wyllie, Ph.D. <i>Division Chairman</i>
Humanities and Social Sciences	David M. Grether, Ph.D. <i>Division Chairman</i>
Physics, Mathematics and Astronomy	Edward C. Stone, Jr., Ph.D. <i>Division Chairman</i>
CONCLUDING REMARKS	President Goldberger
BENEDICTION	Mr. Naylor
RECESSIONAL	The Caltech Wind Ensemble Brass and Organ
ORGAN POSTLUDE	Leslie Deutsch

Candidates for Degrees

BACHELOR OF SCIENCE

Mark Scott Abeln *St. Louis, Missouri* Physics
Kenneth Allen Adelman *Wilton, Connecticut* Engineering and Applied Science
David Sanders Agabra *Azusa, California* Electrical Engineering
Sanjay Kumar Agrawal *Hong Kong* Engineering and Applied Science
Armando Daniel Arias *Los Angeles, California* Engineering and Applied Science
Betsy Marlene Arnold *Salem, Oregon* Physics
Peter Dell Ashcroft *Reedley, California* Applied Physics
William David Banks *Ridgecrest, California* Mathematics
Michael E. Baumer *San Diego, California* Geophysics
Kenneth D. Bell III *Spokane, Washington* Biology
Mihir Bellare *Delhi, India* Mathematics
Karyn Jean Betzen *Tucson, Arizona* Biology
Robert James Bolender *Seattle, Washington* Engineering and Applied Science
Felice Faye Borisy *Madison, Wisconsin* Biology
Jon Charles Brendsel *McLean, Virginia* Electrical Engineering
Daniel Shenon Briggs *Mill Valley, California* Applied Mathematics
Michael John Bronikowski *Milwaukee, Wisconsin* Chemistry and Mathematics
John Anthony Bruckner *Redlands, California* Engineering and Applied Science
Donald Allen Buchholz *Mt. Angel, Oregon* Chemical Engineering
Tom C. Bulgerin *Minneapolis, Minnesota* Physics
Brian D. Burk *Prairie Village, Kansas* Applied Physics
Margaret Caroline Carter *San Jose, California* Engineering and Applied Science
Dara Janine Chang *Cerritos, California* Engineering and Applied Science
Christopher Tuan Chen *Las Cruces, New Mexico* Physics
Scott Shouyu Chou *Norman, Oklahoma* Electrical Engineering
Tammy Lynn Choy *Wahiawa, Hawaii* Engineering and Applied Science
Karl Randall Clauser *Albuquerque, New Mexico* Chemistry
Oliver Michael Collins *Key West, Florida* Engineering and Applied Science
Karen Lynn Condie *Albuquerque, New Mexico* Mathematics
Lisa Ann Cummings *Denver, Colorado* Engineering and Applied Science
Alan Ronald Daughton *Syracuse, New York* Physics
Colette Pamela De Moor *Palo Alto, California* Chemical Engineering

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

BACHELOR OF SCIENCE—*Continued*

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

BACHELOR OF SCIENCE — *Continued*

- Jonathan Douglas Happe *St. Anthony, Minnesota* Electrical Engineering
Jonathan David Hartzberg *New York, New York* Geophysics
James Edward Helgren *Glenview, Illinois* Engineering and Applied Science
Lisa Ellen Henderson *Pacific Grove, California* Electrical Engineering
Marc Herant *Paris, France* Physics
Hans Theodore Hermans *Wayne, Pennsylvania* Engineering and Applied Science
John Allen Herndon *Bakersfield, California* Engineering and Applied Science
Charles W. Hershey *Springfield, Illinois* Electrical Engineering and Physics
Robert Lynn Horn *Anaheim, California* Engineering and Applied Science
Bryan Donald Howard *Portland, Oregon* Engineering and Applied Science
Everett William Howe *Sacramento, California* Mathematics
Stephen Dao Hui Hsu *Ames, Iowa* Physics
Charles Ray Hu *Manhattan, Kansas* Engineering and Applied Science
Kwanghak Huh *Seoul, Korea* Engineering and Applied Science
David M. Hull *Lawrence, Kansas* Engineering and Applied Science and Mathematics
Nathan Noah Hurvitz *Los Angeles, California* Applied Physics
Jung Choon Im *Des Plaines, Illinois* Physics and Applied Mathematics
Dave Ku Kang *Torrance, California* Electrical Engineering
Scott Clark Karlin *Manhattan Beach, California* Electrical Engineering
Ara Kassabian *Los Angeles, California* Physics
Daniel Richard Kegel *Issaquah, Washington* Engineering and Applied Science and Biology
James Paul Kennedy *Birmingham, Alabama* Chemical Engineering
Sung Hoon Kim *Glendale, California* Engineering and Applied Science
Andrew Tsu-Hsin King *Hollywood, California* Engineering and Applied Science
Peter Francis Xavier Konopka *Smithtown, New York* Physics
Chris Duro Koresko *Overland Park, Kansas* Physics
Joseph Michael Kovalik *Montreal, Quebec, Canada* Physics
Frank Ernest Kragh *Goshen, New York* Electrical Engineering
Ashok Venketaraman Krishnamoorthy *Madras, India* Engineering and Applied Science
Rajeev Krishnamoorthy *Calcutta, India* Engineering and Applied Science
Santosh Narayanan Krishnan *Trivandrum, India* Biology
Mark Alan Laffoon *Ottawa, Canada* Geochemistry
Stephen John Lalli *Portland, Oregon* Electrical Engineering
Thientu Thi Lam *Riverside, California* Chemical Engineering
Heidi Jo Langeberg *Sebastopol, California* Electrical Engineering
Taylor Walton Lawrence *Montevallo, Alabama* Physics

BACHELOR OF SCIENCE — *Continued*

- Sandra Lynn Lee** *Berkeley, California* Chemistry
Jeffrey A. Lester *Portland, Oregon* Electrical Engineering
Adam Henry Lewenberg *Ventura, California* Mathematics
Victor Leyva *Los Angeles, California* Physics
Drew Thomas Lindberg *Long Beach, California* Physics
James T. Liu *Glenview, Illinois* Physics
Daniel Elliott Loeb *Skokie, Illinois* Mathematics
Sylvia Luedeking *Pullman, Washington* Mathematics
Thomas Cho-Tak Luke *Ottawa, Ontario, Canada* Physics
Brian J. Lund *Novato, California* Physics
Marie-Yvette Madrid *Glendale, California* Chemical Engineering
Alan Kazunari Marumoto *Torrance, California* Chemistry
Takako Matoba *New York, New York* Engineering and Applied Science
Mark McDonald *Rochester, New York* Applied Physics
Michael J. McDowell *Tucson, Arizona* Electrical Engineering
Janet Mary McWaid *West Los Angeles, California* Electrical Engineering
Samuel Thomas Megeath *Las Cruces, New Mexico* Physics
Brian Douglas Metscher *Dallas, Texas* Geophysics
Henry L. Meuret III *Prosser, Washington* Electrical Engineering
Salman Mitha *Karachi, Pakistan* Physics
Steven Edward Molnar *Webster Groves, Missouri* Electrical Engineering
Milagros Montalvo *Guaynabo, Puerto Rico* Engineering and Applied Science
Mario Alberto Montessori *Vancouver, British Columbia, Canada* Engineering and Applied Science
Lee Anna Rochelle Moreland *Gig Harbor, Washington* Engineering and Applied Science
Esther Proctor Morss *Beverly Farms, Massachusetts* Engineering and Applied Science
Brandon Jay Mymudes *Decatur, Georgia* Electrical Engineering
Derrick H. Nguyen *San Francisco, California* Electrical Engineering
Yannis Nikoleris *Thessaloniki, Greece* Engineering and Applied Science
Eric M. Olafson *East Islip, New York* Engineering and Applied Science
Kim Chi-King Pao *Hong Kong* Engineering and Applied Science
Sung Min Park *Tustin, California* Chemical Engineering and Biology
Janice Diane Pata *Lompoc, California* Biology
Massoud Pedram *Pasadena, California* Electrical Engineering
Matthew Penn *Seymour, Connecticut* Astronomy
Tracy Vaughn Petersen *Sacramento, California* Engineering and Applied Science
Karla Anne Peterson *Warwick, Rhode Island* Geophysics

BACHELOR OF SCIENCE—Continued

- Deborah Shari Pinck *Northridge, California* Electrical Engineering
Kenneth Allen Poppleton *Enumclaw, Washington* Electrical Engineering
Brian Scott Porter *Port Ludlow, Washington* Electrical Engineering
Steve Rabin *New York City, New York* Mathematics
Irene Louise Replogle *Hopkins, Minnesota* Engineering and Applied Science
Michael Anthony Rigler *Helena, Montana* Physics
David Wayne Ring *West Seneca, New York* Physics
Stephen Daniel Ritchie *Boston, Massachusetts* Chemical Engineering
Michael J. Roberts *Midland, Michigan* Physics
John Paton Rostykus *Bellevue, Washington* Electrical Engineering
Gary Scott Rowland *Raytown, Missouri* Engineering and Applied Science
Steve Scot Roy *El Paso, Texas* Physics
Janice Fusae Sakai *Gardena, California* Biology
Sarah Jane Santoro *Rocky Point, New York* Engineering and Applied Science
Steven Bradley Sawkins *San Gabriel, California* Mathematics
Janet Marie Saylor *Worcester, Massachusetts* Physics
Johannes Patrick Schmidt *Boulder, Colorado* Engineering and Applied Science
Fred Christian Schock *Seattle, Washington* Engineering and Applied Science
Marc Philip Schuyler *Tarzana, California* Engineering and Applied Science and Social Science
Joel Aaron Seely *Lakewood, California* Physics
Se Jung Shin *Downey, California* Biology
Steve S. Shin *Glendale, California* Engineering and Applied Science and Biology
Lawrence Ralph Siegel *Plainview, New York* Applied Physics
Everett Furber Simons *Parsippany, New Jersey* Engineering and Applied Science
Lisa Lorraine Skrumeda *Salem, Oregon* Physics
Milton Rudolph Smith III *Bethany, West Virginia* Chemistry
Sherry Lynn Smith *Stroudsburg, Pennsylvania* Astronomy
Myles Andrew Sussman *Denver, Colorado* Engineering and Applied Science
Andrew C. Swanson *Bethel Park, Pennsylvania* Applied Physics
Michael Lawrence Takayama *Fresno, California* Engineering and Applied Science
Jonathan King Tash *Tucson, Arizona* Physics and Mathematics
Steven Dion Thomas *Tahlequah, Oklahoma* Electrical Engineering
Brian James Tsai *Taipei, Taiwan* Chemical Engineering
Yosufi Mohamed Tyebkhan *Hong Kong* Engineering and Applied Science
Thomas Lee Tysinger *Macungie, Pennsylvania* Engineering and Applied Science
Rodney Doyle Van Meter III *Williamson, West Virginia* Engineering and Applied Science
Samuel Sheng-Hung Wang *Riverside, California* Physics

BACHELOR OF SCIENCE—*Continued*

Joy Kimi Watanabe *Seattle, Washington* Applied Physics
Ryoji Watanabe *Mountain View, California* Physics
David Gregg Werntz *Muskogee, Oklahoma* Engineering and Applied Science
Robert Theodore Weverka *Idyllwild, California* Applied Physics
Robin Darryl Whitt *Vienna, Virginia* Engineering and Applied Science
Kevin Earl Wilson *Strathmore, California* Physics
Robin Katherine Wilson *Ventura, California* Biology
Yiu-Fai Isaac Wong *Hong Kong* Electrical Engineering and Mathematics
Thomas Wilson Workman *Los Angeles, California* Physics
John Mark Wright *Sumner, Washington* Electrical Engineering
Mingjim Wu *Oceanside, California* Chemistry
Michael Thomas Yamada *Carson, California* Chemistry
Joseph Yang *Alexandria, Virginia* Engineering and Applied Science
Kaming Wilson Yee *Sacramento, California* Engineering and Applied Science
Chang Dong Yoo *Seoul, Korea* Engineering and Applied Science
Amy Mitsue Yoshida *Kailua, Hawaii* Electrical Engineering
Paul Michael Young *North Hampton, New Hampshire* Applied Physics
Hsiu-Tung Yu *Palo Alto, California* Electrical Engineering
Min Su Yun *Rancho Palos Verdes, California* Physics
Dennis Fabian Zaritsky *Whittier, California* Physics

MASTER OF SCIENCE

- Ardsher Ahmed (*Electrical Engineering*) B.S.E.E., NED University of Engineering and Technology, Karachi 1985.
- Hojin Ahn (*Mechanical Engineering*) B.S., California Institute of Technology 1985.
- Khaled Amer (*Electrical Engineering*) B.Sc., Cairo University 1980.
- Robert Christopher Anderson III (*Electrical Engineering*) A.B., Occidental College 1984; B.S., California Institute of Technology 1984.
- Amir Fuad Atiya (*Electrical Engineering*) B.Sc., Cairo University 1982; M.Sc., 1985.
- Douglas D. Axe (*Chemical Engineering*) B.S., University of California, Berkeley 1984.
- Sanjay Bajaj (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Kharagpur 1985.
- Mark Lewis Baldwin (*Mechanical Engineering*) B.S., California State University, Long Beach 1985.
- Brenda Janet Baldwin-Zuschke (*Chemistry*) B.S., Tulane University 1981.
- Jasho Jiban Banik (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Kharagpur 1985.
- Nicholas Bates Bauer (*Environmental Engineering Science*) B.S., University of Virginia 1981.
- Jill Gabrielle Bauman (*Electrical Engineering*) B.S. (Electrical Engineering), University of Pennsylvania 1984; B.S. (Economics), 1984.
- Douglas Jon Bennett (*Mathematics*) B.A., University of California, Los Angeles 1984.
- James Maxwell Berman (*Electrical Engineering*) B.S., University of California, Los Angeles 1979.
- Thierry Bernard (*Electrical Engineering*) Diplôme d'Ingénieur, École Polytechnique 1983; Diplôme d'Ingénieur, École Nationale Supérieure de Techniques Avancées 1985.
- Faruk Bilalovic (*Electrical Engineering*) B.Sc., University of Sarajevo 1975.
- Dražen Borković (*Electrical Engineering*) B.Sc., University of Belgrade 1985.
- Dennis Michael Borowy (*Electrical Engineering*) B.S.E.E., University of Hartford 1980; M.B.A., 1982.
- Alan Livingston Bostick (*Physics*) B.S., University of Washington 1984.
- David Jones Brady (*Applied Physics*) B.A., Macalester College 1983.
- Lynda Catherine Brinson (*Applied Mechanics*) B.S., Virginia Polytechnic Institute and State University 1985.
- Dan Khoa Bui (*Electrical Engineering*) B.S.E.E., The University of Texas at Austin 1985.
- Lawrence Martin Burns (*Electrical Engineering*) B.S.E.E., University of Maryland 1982.
- Gregory Scott Cardell (*Aeronautics*) B.A., Reed College 1981.
- Scott Allen Carr (*Aeronautics*) B.S., University of Massachusetts at Amherst 1985.
- Deborah Reich Castleman (*Electrical Engineering*) B.S., California State Polytechnic University, Pomona 1981.

MASTER OF SCIENCE—Continued

- Steven Louis Ceccio (*Mechanical Engineering*) B.S.E., The University of Michigan 1985.
- Wingsiu Richard Chan (*Mechanical Engineering*) S.B., Massachusetts Institute of Technology 1985.
- Chi-Chao Chao (*Electrical Engineering*) B.S., National Taiwan University 1983.
- Wei Chen (*Civil Engineering*) B.S., Tongji University 1982.
- Tzi-Dar Chiueh (*Electrical Engineering*) B.S., National Taiwan University 1983.
- Piranart Chokwatana (*Chemical Engineering*) B.Eng., Chulalongkorn University 1984.
- David Hsingkuo Chow (*Applied Physics*) B.S., Case Western Reserve University 1984.
- William Kai-Mo Chow (*Applied Mechanics*) B.Eng., McMaster University 1982; M.Eng., 1984.
- Harry Soot-Shang Chu (*Electrical Engineering*) B.S., Polytechnic Institute of New York 1985.
- Sung Hwan Chun (*Electrical Engineering*) B.E., Yonsei University 1984.
- Young Hoon Chung (*Electrical Engineering*) B.S., California Institute of Technology 1985.
- John Timothy Coffey (*Electrical Engineering*) B.E., University College Dublin 1985.
- Timothy Richard Colvin (*Applied Mathematics*) A.B., University of California, Berkeley 1981.
- Spiridon H. Courellis (*Electrical Engineering*) Diploma, Aristoteleion University of Thessalonika 1985.
- Uma Devi Dasika (*Electrical Engineering*) B.S., Rutgers, The State University 1983.
- Jonathan Devakumar Dharmapalan (*Electrical Engineering*) B.S., Northeastern University 1985.
- Steven William Drost (*Electrical Engineering*) B.S., University of Lowell 1984.
- Ajit Dubhashi (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Bombay 1983.
- Christopher John Eich (*Physics*) B.S., University of Santa Clara 1983.
- Kent Franklin Evans (*Astronomy*) B.S., California Institute of Technology 1983.
- Brian Andrew Fagan (*Mechanical Engineering*) B.S., University of California, Irvine 1985.
- Alain Daniel Feingold (*Electrical Engineering*) Diplôme d'Ingénieur, École Polytechnique 1984.
- Mary Kay Kramer Flagg (*Chemical Engineering*) B.S., Rice University 1984.
- David Smith Folweiler (*Electrical Engineering*) B.S.E.E., University of Massachusetts at Amherst 1985.
- John Theodore Fourkas (*Chemistry*) B.S., California Institute of Technology 1986.
- Jorge Luis Galazzo (*Chemical Engineering*) Chem.Eng., National University of the Litoral 1980.

MASTER OF SCIENCE — *Continued*

- Nicolas A. Gaspard (*Electrical Engineering*) Diplôme d'Ingénieur, École Polytechnique 1983; Diplôme d'Ingénieur, École Nationale Supérieure de l'Aéronautique et de l'Espace 1985.
- Douglas Read Gault (*Electrical Engineering*) B.S., United States Military Academy 1977.
- Stephen Ian Gevirtz (*Electrical Engineering*) B.S.E.E., Tufts University, 1985.
- Thomas Gerald Green (*Applied Mechanics*) B.S., United States Air Force Academy 1979.
- Adiel Guinzburg (*Aeronautics*) B.Sc., University of the Witwatersrand 1985.
- Eric John Gundersen (*Aeronautics*) B.S., Texas A&M University 1985.
- Michael Anthony Stephen Guth (*Social Science*) B.A., Rice University 1982.
- Philip Charles Haubert (*Physics*) B.S., Michigan State University 1983.
- Roland Edward Heersink (*Chemical Engineering*) B.Sc., University of Alberta 1982.
- Steinar Hetland (*Civil Engineering*) Siv.Ing., Norwegian Institute of Technology 1980.
- Michael Eugene Hoenk (*Physics*) B.S.(Physics), University of Iowa 1984; B.S. (Mathematics), 1984.
- Watche Stepan Hoknayan (*Electrical Engineering*) M.S.E., Polytechnic Institute of Yerevan 1979.
- Matthew Scott Holcomb (*Electrical Engineering*) B.S., Colorado State University 1985.
- Tyler Lee Housel (*Materials Science*) B.S., Rensselaer Polytechnic Institute 1983.
- Raymond Scott Hudson (*Electrical Engineering*) B.S., California Institute of Technology 1985.
- Fujio Iinoya (*Applied Physics*) B.S., University of Wisconsin-Madison 1984.
- Justin Tsz Ching Ip (*Chemical Engineering*) S.B., Massachusetts Institute of Technology 1984.
- Olivier Michel Jarrault (*Mechanical Engineering*) Diplôme d'Etat d'Ingénieur, Centre d'Études Supérieures des Techniques Industrielles 1984.
- Steven Joseph Jordan (*Applied Mathematics*) B.S., University of Massachusetts at Amherst 1979.
- Sotiris Alexander Kanaris (*Electrical Engineering*) Diploma, Aristoteleion University of Thessalonika 1985.
- Toru Katsumoto (*Electrical Engineering*) B.E., Tokyo Institute of Technology 1980; M.E., 1982.
- Davut Kavranoglu (*Electrical Engineering*) B.S., Technical University of Istanbul 1984.
- Julie Ann Kern (*Environmental Engineering Science*) B.S., Davidson College 1985.
- Walter Scott Kiefer (*Planetary Science*) B.S., Texas Christian University 1984.
- David Jaemin Kim (*Aeronautics*) B.S., Yale College 1985.
- Andrew T. King (*Electrical Engineering*) B.S., California Institute of Technology 1986.

MASTER OF SCIENCE — *Continued*

- Paul Thomas Kinney (*Physics*) B.S., Oregon State University 1982.
- Elias Kiritsis (*Physics*) B.S., University of Athens 1984.
- Brian Scott Kirking (*Civil Engineering*) B.S.C.E., University of Southern California 1983.
- Jennifer Joan Kolden (*Mechanical Engineering*) B.S.M.E., University of Washington 1985.
- Michael David Kovari (*Physics*) B.A., Churchill College, University of Cambridge 1982.
- Ching-Horng Kuo (*Electrical Engineering*) B.S., Christian Brothers College 1984.
- Vitaly Kupisk (*Mathematics*) B.S., California Institute of Technology 1982.
- Bridget Mary Landry (*Planetary Science*) B.A., University of California, San Diego 1984.
- John Paul Lazzaro (*Computer Science*) B.S.(*Electrical Engineering*), University of Pennsylvania 1984; B.S.(*Computer Science Engineering*), 1984.
- Stephen Douglas Lee (*Chemistry*) B.S., University of California, Davis 1984.
- John Scott Lenney (*Electrical Engineering*) B.S., LeTourneau College 1984.
- Denis Francois Limongi (*Electrical Engineering*) Diplôme d'Ingénieur, École Nationale Supérieure d'Electronique et de Radioélectrité de Grenoble 1985.
- Kerry Ira Litvin (*Electrical Engineering*) B.S.E.E., Drexel University 1985.
- Lingyun Lu (*Aeronautics*) B.S., Beijing Institute of Aeronautics and Astronautics 1983.
- William Lee Lyons (*Chemical Engineering*) B.S., University of California, Santa Barbara 1980.
- Parker MacCready (*Engineering Science*) B.A., Yale College 1982.
- Mary Ann Cecilia Maher (*Computer Science*) B.S., Pennsylvania State University 1982.
- Anamitra Makur (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Kharagpur 1985.
- James Michael McBride (*Electrical Engineering*) B.S.E.E., Seattle University 1985.
- John Douglas McGill (*Physics*) B.S., Massachusetts Institute of Technology 1983.
- Arie M. Michelsohn (*Biology*) A.B., Columbia University 1982.
- M. Coleman Miller (*Physics*) B.S., Hillsdale College 1984.
- Franklin Perry Mills (*Physics*) B.S.E., Princeton University 1984.
- Azita Mohammadi (*Electrical Engineering*) B.S., California State University, Northridge 1984.
- James Jongryn More (*Social Science*) B.A., Cornell University 1985.
- Frank Edward Mullen (*Electrical Engineering*) B.S., United States Coast Guard Academy 1979.
- Dwight Matthew Munk (*Electrical Engineering*) B.S., University of Southern California 1980.

MASTER OF SCIENCE — *Continued*

- Andrew Howard Mutz (*Applied Physics*) B.S.(Physics), Massachusetts Institute of Technology 1984; B.S.(Mechanical Engineering), 1984.
- Thomas Joseph Nadeau (*Electrical Engineering*) B.S.E.E., Clemson University 1985.
- Russell Lawrence Natter (*Chemical Engineering*) B.S., California Institute of Technology 1985.
- Ricky Chiu-Yin Ng (*Chemical Engineering*) B.S., University of Houston 1983.
- Tak-Kwong Ng (*Computer Science*) B.E., The Cooper Union 1975; M.S.E.E., Syracuse University 1976.
- Truong Quang Nguyen (*Electrical Engineering*) B.S., California Institute of Technology 1985.
- Paul Scott Northrop (*Chemical Engineering*) B.S., Washington University 1983.
- Jonathan Alan Nourse (*Geology*) B.S., Colorado School of Mines 1983.
- John Andrew Nurse (*Electrical Engineering*) B.E.E., GMI Engineering and Management Institute 1984.
- Janardan Gangadhar Padale (*Civil Engineering*) B.S., Ahmednagar College 1957; M.S., University of Poona 1965.
- Andrew Stanley Paterson (*Environmental Engineering Science*) B.S.E., The University of Michigan 1984.
- Tanya Peratis Pemberton (*Aeronautics*) S.B., Massachusetts Institute of Technology 1985.
- Curt Daniel Petrucelli (*Applied Mechanics*) B.E., Stevens Institute of Technology 1985.
- Cynthia Colleen Piotrowski (*Planetary Science*) B.A., St. Olaf College 1984.
- Zorana Popović (*Electrical Engineering*) B.Sc., University of Belgrade 1985.
- Kevin Cecil Power (*Environmental Engineering Science*) B.Eng., Memorial University of Newfoundland 1983.
- Thomas Lee Power (*Civil Engineering*) B.S.C.E., The University of Texas at Austin 1985.
- Todd Michael Przybycien (*Chemical Engineering*) B.S., Washington University 1984.
- Todd Christopher Pulvino (*Mechanical Engineering*) B.S., University of Wisconsin-Madison 1984.
- Charles Byron Pursell (*Electrical Engineering*) B.S., Purdue University 1985.
- Yasantha Nirmal Rajakarunanayake (*Applied Physics*) B.S.E., Princeton University 1985.
- Marco Rasi (*Civil Engineering*) Ingegneria Civile-Sezione Idraulica, Università Degli Studi di Pisa 1984.
- Brian K. Rasnow (*Physics*) B.S., California Polytechnic State University, San Luis Obispo 1984.
- Soo-Jong Rey (*Physics*) B.S., Seoul National University 1982; Sc.M., Brown University 1983.
- Michael Allen Rider (*Chemistry*) B.S., University of Southern California 1983.

MASTER OF SCIENCE — *Continued*

- Ricardo Salvador Sánchez Peña (*Electrical Engineering*) Ingeniería Electromecánica, Universidad de Buenos Aires 1979.
- Koichi Sayano (*Applied Physics*) B.S., California Institute of Technology 1985.
- David Lawrence Schweizer (*Computer Science*) B.S., Yale College 1984.
- Michael James Scott (*Environmental Engineering Science*) B.A., Rice University 1985.
- James Earle Shisley (*Applied Mathematics*) B.S., California State University, Northridge 1984.
- Martin Siegel (*Electrical Engineering*) B.S., California State Polytechnic University, Pomona 1984.
- Hong Sima (*Environmental Engineering Science*) B.S., Hunan University 1982; M.S., Tsinghua University 1984.
- Massimo Anthony Sivilotti (*Computer Science*) B.S., Queen's University 1983.
- Roy Stephen Smith (*Electrical Engineering*) B.E., University of Canterbury, 1980; M.E., 1981.
- Mary Christine Stordal (*Geochemistry*) B.S., Texas A&M University 1979; M.S. 1981.
- Mohammad Jamil Din Tahir-Kheli (*Physics*) B.A., Oriel College, Oxford University 1985.
- Douglas Kelvin Thompson (*Chemistry*) B.S., Abilene Christian University 1983.
- Phillip Takeo Tokumaru (*Aeronautics*) B.S.E., University of Pennsylvania 1985.
- Yasuo Tomita (*Electrical Engineering*) B.S., Hokkaido University 1978; M.S., 1980.
- Thomas Lee Tysinger (*Aeronautics*) B.S., California Institute of Technology 1986.
- Joel Stephan Van Baelen (*Electrical Engineering*) B.S.E.E., University of Liege 1985.
- Kevin Spencer Van Horn (*Computer Science*) B.S.(Physics), University of Utah 1982; B.S.(Computer Science), 1982.
- Brian Paul Von Herzen (*Computer Science*) A.B., Princeton University 1980.
- William Wayne Wauford (*Electrical Engineering*) B.S., University of South Florida 1985.
- Shirley Jeannine Whitmore (*Chemical Engineering*) B.S.(Chemical Engineering), The University of Tulsa 1982; B.S.(Applied Mathematics), 1982.
- David John Wilson (*Aeronautics*) B.S.A.A.E., The Ohio State University 1985.
- Karl Dane Wittrop (*Chemical Engineering*) B.S.Ch.E., University of New Mexico 1984.
- Puiwing Wong (*Applied Mathematics*) B.Math., University of Waterloo 1983; M.Math., 1984.
- Kristin Lee Wood (*Mechanical Engineering*) B.S., Colorado State University 1985.
- Fulin Xiong (*Applied Physics*) B.Sc., Chengdu College of Geology 1982.
- Yat Wah Yiu (*Electrical Engineering*) B.S., University of Texas at Austin 1985.
- Tadashi Yoshida (*Electrical Engineering*) B.S., Tokyo Institute of Technology 1977; M.S., 1979.

MASTER OF SCIENCE — *Continued*

- Eddy Ka Ping Young (*Electrical Engineering*) B.Sc., Loughborough University of Technology 1984.
- Pascal Jean Yvon (*Materials Science*) Diplôme d'Ingénieur, École Centrale des Arts et Manufactures Paris 1984; D.E.A., 1984.
- Harold Aaron Zarem (*Applied Physics*) A.B., University of California, Berkeley 1984.
- Lin Zhang (*Electrical Engineering*) B.S., Xi'an Jiaotong University 1982.
- Mei Zhuang (*Aeronautics*) B.E., Beijing Institute of Aeronautics and Astronautics 1984.

ENGINEER

- Pascale Claude Dubois (*Aeronautical Engineer*) Diplôme d'Ingénieur, École National Supérieure d'Ingénieurs de Constructions Aéronautiques 1983; M.S., California Institute of Technology 1984.
- Janet Elizabeth Freeman (*Aeronautical Engineer*) S.B., Massachusetts Institute of Technology 1978; M.S., California Institute of Technology 1984.
- Kazunori Kawasaki (*Aeronautical Engineer*) B.S., Kyoto University 1976; M.S., California Institute of Technology 1984.

DOCTOR OF PHILOSOPHY

DIVISION OF BIOLOGY

- Mark Knowles Bennett (*Neurobiology*) B.S., Oregon State University 1981.
Thesis: Brain Type II Calcium and Calmodulin-Dependent Protein Kinase: Purification, Characterization and Molecular Cloning.
- Madeline Anne Crosby (*Molecular Biology*) B.S., University of California, Davis 1975.
Thesis: Regulation of the *Drosophila* Gluc Gene Sgs-3: Sequences Required for Puffing and Transcription.
- Douglas Arthur Fisher (*Biology*) A.B., Bowdoin College 1979.
Thesis: Class I Genes of the Major Histocompatibility Complex: Structural Studies on Genes of the *Tla* Locus.
- George Loweree Gaines, III (*Biology*) B.S., Yale University 1979.
Thesis: The Control of RNA Synthesis in Isolated HeLa Cell Mitochondria.
- Boning Gao (*Molecular Biology*) B.S., Peking University 1976.
Thesis: The Structure and Expression of the Gene Coding for Bindin, a Species Specific Sea Urchin Protein.
- James Joseph Lee (*Biology*) B.S., State University of New York at Stony Brook 1980.
Thesis: The Genomic Organization and Expression of the Strongylocentrotus Purpuratus Actin Gene Family.
- Katherine Mixer Mayne (*Molecular Biology*) B.A., Bowdoin College 1979.
Thesis: Structural and Functional Studies on the Subunits of the Nicotinic Acetylcholine Receptor.
- Paul Wells Meyer (*Biophysics*) B.S., California Institute of Technology 1979.
Thesis: The Avoidance Response of *Phycomyces* in a Controlled Environment.
- Robert Edwin Pruitt (*Molecular Biology*) B.S., University of Minnesota 1980.
Thesis: Characterization of the Genome of *Arabidopsis thaliana*.
- Yi Henry Sun (*Molecular Biology*) B.S., National Taiwan University 1978.
Thesis: Organization and Evolution of the Class I Genes in the Murine Major Histocompatibility Complex.
- Astar Winoto (*Molecular Biology*) B.A., University of California, Berkeley 1981.
Thesis: Structure and Function of the Murine T-Cell Receptor Genes and the Murine Class I Genes of the Major Histocompatibility Complex.

DIVISION OF CHEMISTRY AND CHEMICAL ENGINEERING

- Alan Brad Anton (*Chemical Engineering*) B.S., Virginia Polytechnic Institute and State University 1979; M.S., California Institute of Technology 1982.
Thesis: Studies of Overlayer Vibrational Structure and Identification of Adsorbed Reaction Intermediates Via Electron Energy Loss Spectroscopy.

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*

- David Nathan Beratan (*Chemistry*) B.S., Duke University 1980.
Thesis: The Theory of Long Distance Charge Transfer Reactions.
- David Francis Blair (*Chemistry*) A.B., Princeton University 1979.
Thesis: Progress Toward Elucidating the Mechanisms of Energy Transduction in Cytochrome c Oxidase.
- Geoffrey A. Blake (*Chemistry*) B.S., Duke University 1981.
Thesis: On The Chemical Composition of Interstellar Molecular Clouds: A Millimeter and Submillimeter Spectral Line Survey of OMC-1.
- Robert J. Cave (*Chemistry*) B.S., Michigan State University 1979.
Thesis: A Theoretical Model for Orientation Effects in Electron Transfer Reactions.
- Francis Gabriel Celii (*Chemistry*) B.A., La Salle College 1979.
Thesis: I. IR Photodissociation Spectroscopy of Large van der Waals Clusters
II. UV Laser-Induced Photochemistry of $\text{Fe}(\text{Co})_5$ on Single Crystal Surfaces.
- Bo Kyung Chi (*Chemical Engineering*) B.S., Massachusetts Institute of Technology 1979.
Thesis: The Motion of Immiscible Drops and the Stability of Annular Flow.
- Paul N. Dunlap (*Chemical Engineering*) B.S.Chem.E., University of Colorado 1978.
M.S., California Institute of Technology 1981.
Thesis: Studies of Flow Modification and Polymer Conformation in Extensional Flows of Dilute Polymer Solutions.
- Constantin George Economou (*Chemical Engineering*) Diploma, National Technical University of Athens 1983.
Thesis: An Operator Theory Approach to Nonlinear Controller Design.
- Walther Robert Ellis, Jr. (*Chemistry*) B.A., University of Miami 1978; B.S., 1978; M.S., 1980.
Thesis: Spectroelectrochemical Studies of Heme and Copper Proteins.
- William C. Finch (*Chemistry*) B.S., The Pennsylvania State University 1981.
Thesis: Synthesis and Reactivity of Transition Metal Methylidene Complexes.
- Lynn Forester (*Chemical Engineering and Chemistry*) B.A., University of California, Santa Cruz 1978; M.S., California Institute of Technology 1980.
Thesis: An Inelastic Electron Tunneling Spectroscopic Study of the Interactions of Cyclic Hydrocarbons with a Zirconium Polymerization Catalyst Supported on Aluminum Oxide.
- Gregory Joseph Gajda (*Chemistry*) B.A., B.S., M.S., Northwestern University 1980.
Thesis: An Inelastic Electron Tunneling Spectroscopic Investigation of Inorganic and Organometallic Molybdenum Complexes Adsorbed on Aluminum Oxide Surfaces.
- Anthony Sigmund Geller (*Chemical Engineering*) B.S.E., Princeton University 1979.
Thesis: A Study of the Creeping Motion of a Sphere Normal to a Deformable Fluid-Fluid Interface: Deformation and Breakthrough.
- Jeff Daniel Gelles (*Chemistry*) A.B., Harvard College 1978.
Thesis: The Cu_A Site in Cytochrome c Oxidase: Its Role in Coupling Electron Transport to Proton Pumping.

DOCTOR OF PHILOSOPHY — *Continued*

- Panagiotis Gerasimou Georgopoulos (*Chemical Engineering*) Diploma, National Technical University of Athens 1980; M.S., California Institute of Technology 1982.
Thesis: Mathematical Studies of Photochemical Air Pollution.
- Laura R. Gilliom (*Chemistry*) A.B., Princeton University 1980.
Thesis: Titanacyclobutanes Derived from Strained, Cyclic Olefins: A New Living Polymerization System.
- Stephen Lloyd Gipson (*Chemistry*) B.S., Baylor University 1981.
Thesis: Electrochemical Studies Related to the Design of New Inorganic Oxidants.
- Pierre Grosdidier (*Chemical Engineering*) B.Eng., M.Eng., McGill University 1979.
Thesis: Interaction Measures for Systems Under Decentralized Control.
- Suzzy Chen Hsi Ho (*Chemistry*) B.S., University of New Hampshire 1980.
Thesis: Synthesis and Reactivity of Transition Metal Homo- and Heterobinuclear Ketene Complexes.
- Diane Marie Hood (*Chemistry*) B.S., University of California, Berkeley 1977.
Thesis: Calculation of e^- -H Scattering Processes using Hyperspherical Coordinates.
- Philip Alan Hookham (*Chemical Engineering*) B.S., University of Illinois, Urbana 1979; M.S., California Institute of Technology 1981.
Thesis: Concentration and Velocity Measurements in Suspensions Flowing Through a Rectangular Channel.
- Michael David Hopkins (*Chemistry*) B.A., University of California, San Diego 1980.
Thesis: The Energetics, Structures, and Dynamics of the $\delta\delta^*$ Excited States of Quadruply Bonded Dimers.
- Alvin David Joran (*Chemistry*) A.B., Harvard College 1980.
Thesis: Photochemical Electron Transfer at Fixed Distance: A Synthetic Model of the Photosynthetic Primary Process.
- Heon Kang (*Chemistry*) B.S., Seoul National University 1977.
Thesis: Gas Phase Studies of Hydrocarbon Oxidation by Chromium Oxide Cation.
- Brian William Keelan (*Chemistry*) B.S., University of Virginia 1980.
Thesis: High Resolution Laser Spectroscopy of Supersonic Jet-Cooled Molecules.
- Marco Aurelio Pinheiro Lima (*Chemistry*) B.Sc., Universidade de Sao Paulo 1978; M.Sc., 1980.
Thesis: Dynamics of Electron-Molecule Collisions.
- Michael John O'Loughlin (*Chemistry*) B.A., Western Maryland College 1980.
Thesis: The Determination of Atom-Molecule Interaction Potentials from Total Differential Cross Sections.
- Brian Paul Reid (*Chemistry*) B.S., Marietta College 1981.
Thesis: Elastic, Inelastic and Photofragment Scattering from Crossed Molecular Beams.
- Steve Chester Schultz (*Chemistry*) B.A., Carleton College 1981.
Thesis: Site Saturation Mutagenesis of Residue 71 in β -Lactamase.

DOCTOR OF PHILOSOPHY — *Continued*

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

Thesis: Investigations of Plasmid-Host Cell Interactions in Recombinant *Escherichia coli* Populations.

Gerald Siu (*Chemistry*) B.S., University of Maryland 1980.

Thesis: Antigen Receptors on Lymphocytes.

Michael Glenn Smith (*Chemistry*) B.S., Texas A&M University 1980.

Thesis: Approaches to the Syntheses of the Acyltetramic Acid Antibiotics Striptolydigin, Tirandamycin A, and Tirandamycin B.

John Robert Stille (*Chemistry*) B.A., University of Colorado 1981.

Thesis: The Synthetic Versatility of Titanocene Methylidene Sources and Their Utility in the Total Synthesis of Capnellene.

Alan Paul Sylwester (*Chemistry*) B.S., University of California, Riverside 1978.

Thesis: Matrix Isolation and Characterization of 1,1-Diazenes.

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

Thesis: Synthesis and Investigations into the Reactivity of Electron Deficient Organoscandium Complexes.

Margaret A. Tolbert (*Chemistry*) B.A., Grinnell College 1979; M.S., University of California, Berkeley 1982.

Thesis: Mechanisms and Energetics of Alkane Activation by Transition Metal Ions in the Gas Phase.

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

Thesis: Approach to the Synthesis of Chlorothricolide: Synthesis of (\pm)-19, 20-Dihydro-24-O-methylchlorothricolide, methyl ester, ethyl carbonate.

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

Thesis: Approach to the Synthesis of the Acyltetramic Acid Antibiotic Bu-2313.

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

Thesis: Nucleation and Growth of Aerosols.

DIVISION OF ENGINEERING AND APPLIED SCIENCE

Khaled Ahmed Sabry Abdel-Ghaffar (*Electrical Engineering*) B.Sc., Alexandria University 1980; M.S., California Institute of Technology 1983.

Thesis: An Information- and Coding-Theoretic Study of Bursty Channels with Applications to Computer Memories.

DOCTOR OF PHILOSOPHY—*Continued*

- Douglas Ray Adkins (*Mechanical Engineering*) B.S., University of Louisville 1979; M.Eng., 1980.
Thesis: Analyses of Hydrodynamic Forces on Centrifugal Pump Impellers.
- Mark Carter Anderson (*Applied Mechanics*) B.S., Christian Brothers College 1977; M.S., California Institute of Technology 1979.
Thesis: A Study of the Periodic and Quasi-Periodic Solutions of the Discrete Duffing Equation.
- Michael Atzmon (*Applied Physics*) B.Sc., Hebrew University of Jerusalem 1980; M.S., California Institute of Technology 1982.
Thesis: A Study of Bulk Amorphous Alloys Formed by Solid-State Reaction in Elemental Composites.
- Thomas Clyde Banwell (*Applied Physics*) B.S., Harvey Mudd College 1978; M.S., California Institute of Technology 1980.
Thesis: Investigations of Atomic Transport Induced by Heavy Ion Irradiation.
- Christopher Louis Barrett (*Engineering Science/Bioinformation Systems*) B.S., University of New Mexico 1976; M.S., California Institute of Technology 1983.
Thesis: On Central Processes in the Temporal Control of Movement.
- Janet A. Blume (*Applied Mechanics*) B.S.E., Princeton University 1982; M.S., California Institute of Technology 1983.
Thesis: Some Issues in the Kinematics of Finite Deformations.
- William Michael Bruno (*Electrical Engineering*) B.S., University of California, San Diego 1981; M.S., California Institute of Technology 1983.
Thesis: Powder Core Dielectric Waveguides.
- Martha Harriet Conklin (*Environmental Engineering Science*) B.A., Mount Holyoke College 1976; M.S., California Institute of Technology 1980.
Thesis: Thermodynamics, Kinetics and Mechanisms of the Reactions of S(IV) with Cu(II) and Fe(III).
- William James Dally (*Computer Science*) B.S., Virginia Polytechnic Institute 1980; M.S., Stanford University 1981.
Thesis: A VLSI Architecture for Concurrent Data Structures.
- Abraham A. Dauhajre (*Electrical Engineering*) B.S.E.E., University of Puerto Rico, Mayaguez 1980; M.S., California Institute of Technology 1982.
Thesis: Modelling and Estimation of Leakage Phenomena in Magnetic Circuits.
- Sayed-Amr El-Hamamsy (*Electrical Engineering and Computer Science*) B.Sc., Cairo University 1979; B.Sc., Ain Shams University 1981; M.S., California Institute of Technology 1982.
Thesis: Coupled-Inductor Inversion, Rectification and Cycloconversion.
- Harry Andrew Gray (*Environmental Engineering Science*) B.S., Carnegie-Mellon University 1979; M.S., California Institute of Technology 1980.
Thesis: Control of Atmospheric Fine Primary Carbon Particle Concentrations.

DOCTOR OF PHILOSOPHY — *Continued*

Roch Guérin (*Electrical Engineering*) Diplôme d'Ingénieur, École Nationale Supérieure des Télécommunications 1983; M.S., California Institute of Technology 1984.

Thesis: Queueing and Traffic in Cellular Radio.

Michael William Haney (*Electrical Engineering*) B.S., University of Massachusetts 1976; M.S., University of Illinois 1978.

Thesis: Acousto-Optical Time-and-Space Integrating Processors for Real-Time Synthetic Aperture Radar Imaging.

Gavin Julian Hendricks (*Mechanical Engineering*) B.Sc., University of Cape Town 1981; M.S., California Institute of Technology 1983.

Thesis: Two Mechanisms of Vorticity Generation in Combusting Flow Fields.

Steven Robert Hetzler (*Applied Physics*) B.A., Carleton College 1980; M.S., California Institute of Technology 1982.

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

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

Thesis: Flow-Induced Vibration of Long Structures.

Robert James Lang (*Applied Physics*) B.S., California Institute of Technology 1982; M.S., Stanford University 1983.

Thesis: Semiconductor Lasers: New Geometries and Spectral Properties.

Hyuk Lee (*Applied Physics*) B.S., Seoul National University 1978; M.S., California Institute of Technology 1982.

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

Harrison Mon Fook Leong (*Engineering Science/Bioinformation Systems*) B.A., Claremont Men's College 1980.

Thesis: Frequency Dependent Electromagnetic Fields: Models Appropriate for the Brain.

Peyyun Peggy Li (*Computer Science*) B.S., National Taiwan University 1976; M.S., 1979.

Thesis: A Parallel Execution Model for Logic Programming.

Richard Craig Mosteller (*Computer Science*) B.S., Northrop Institute of Technology 1968; M.S., California Institute of Technology 1981.

Thesis: Monte Carlo Methods for 2-D Compaction.

Dimitris Antony Papantoniou (*Engineering Science and Aeronautics*) B.S., California Institute of Technology 1978; M.S., 1979.

Thesis: Observations in Turbulent Buoyant Jets by Use of Laser Induced Fluorescence.

Ralph Peek (*Civil Engineering*) B.E., University of Canterbury 1980; S.M., Massachusetts Institute of Technology 1982.

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

Harry Francis Robey III (*Aeronautics*) B.S.E., Duke University 1979; M.S., California Institute of Technology 1981.

Thesis: The Nature of Oblique Instability Waves in Boundary Layer Transition.

DOCTOR OF PHILOSOPHY — *Continued*

- Tuviah Ehud Schlesinger (*Applied Physics*) B.Sc., University of Toronto 1980; M.S., California Institute of Technology 1982.
Thesis: Optical and Opto-Electronic Investigations of Semiconductor Defects and Heterostructures.
- David William Schwendeman (*Applied Mathematics*) B.S.E., University of Michigan 1981.
Thesis: Numerical Shock Propagation Using Geometrical Shock Dynamics.
- Lorenz Willard Sigurdson (*Aeronautics*) B.A.Sc., University of Toronto 1978; M.S., California Institute of Technology 1980.
Thesis: The Structure and Control of a Turbulent Reattaching Flow.
- Stewart A. Silling (*Applied Mechanics*) S.B., Massachusetts Institute of Technology 1977; M.Eng., University of California, Berkeley 1980.
Thesis: Singularities and Phase Transitions in Elastic Solids: Numerical Studies and Stability Analysis.
- John Stephen Smith (*Applied Physics*) B.S., California Institute of Technology 1980; M.S., 1981.
Thesis: III-V Molecular Beam Epitaxy Structures for Electronic and Optoelectronic Applications.
- Kumar Swaminathan (*Electrical Engineering*) B.Tech., Indian Institute of Technology, Madras 1981; M.S., California Institute of Technology 1982.
Thesis: Analysis and Demonstration of the Quantile Vocoder.
- Constantine Emmanuel Synolakis (*Civil Engineering*) B.S., California Institute of Technology 1978; M.S., 1979.
Thesis: The Runup of Long Waves.
- Thiam-Soon Tan (*Civil Engineering*) B.E., University of Canterbury 1979; M.S., California Institute of Technology 1982.
Thesis: Two-Phase Soil Study: A. Finite Strain Consolidation. B. Centrifuge Scaling Considerations.
- John Edward Tanner (*Computer Science*) B.A., Wartburg College 1979; M.S., California Institute of Technology 1980.
Thesis: Integrated Optical Motion Detection.
- Stephen Taylor (*Aeronautics*) B.S., University of Florida 1976; M.S., California Institute of Technology 1977.
Thesis: The Effects of Large-Eddy Manipulator Devices on the Turbulent Spot and the Turbulent Boundary Layer.
- Tawach Ungsuwarungsri (*Mechanical Engineering*) B.S., California Institute of Technology 1981; M.S., 1982.
Thesis: The Effect of Strain-Softening Cohesive Material on Crack Stability.
- Jakob Johannes van Zyl (*Electrical Engineering*) B.Eng., University of Stellenbosch 1979; M.S., California Institute of Technology 1983.
Thesis: On the Importance of Polarization in Radar Scattering Problems.

DOCTOR OF PHILOSOPHY — *Continued*

- Ramanarayanan Venkataramanan (*Electrical Engineering*) B.E., P.S.G. College of Technology 1970; M.E., Indian Institute of Science, Bangalore 1975; M.S., California Institute of Technology 1983.
Thesis: Sliding Mode Control of Power Converters.
- Jed Michael Waldman (*Environmental Engineering Science and Planetary Science*) B.S., University of Florida 1978; M.S., California Institute of Technology 1980.
Thesis: Depositional Aspects of Pollutant Behavior in Fog.
- Chung-en Zah (*Electrical Engineering*) B.S., National Taiwan University 1977; M.S., 1979; M.S., California Institute of Technology 1982.
Thesis: Millimeter-Wave Monolithic Schottky Diode Imaging Arrays.
- Jeffrey Alan Zelt (*Civil Engineering*) B.Sc., University of British Columbia 1980; M.S., California Institute of Technology 1981.
Thesis: Tsunamis: The Response of Harbours with Sloping Boundaries to Long Wave Excitation.
- Jinlin Zhu (*Engineering Science*) M.S., Tsinghua University 1981.
Thesis: Internal Solitons Generated by Moving Disturbances.

DIVISION OF GEOLOGICAL AND PLANETARY SCIENCES

- Holly Kathleen Eissler (*Geophysics*) B.S., University of Illinois at Urbana-Champaign 1979; M.S., California Institute of Technology 1982.
Thesis: Investigations of Earthquakes and Other Seismic Sources in Regions of Volcanism.
- Gerald Jonathan Fine (*Geology*) B.A., Amherst College 1980.
Thesis: Carbon Dioxide in Synthetic and Natural Silicate Glasses.
- George Ellery Gehrels (*Geology*) B.S., University of Arizona 1978; M.S., University of Southern California 1980.
Thesis: Geologic and Tectonic Evolution of Annette, Gravina, Duke and Southern Prince of Wales Islands, Southeastern Alaska.
- Stephen Grand (*Geophysics*) B.Sc., McGill University 1978.
Thesis: Shear Velocity Structure of the Mantle Beneath the North American Plate.
- Mark Alan Richards (*Geophysics*) B.S., University of Texas at Austin 1977; M.S., California Institute of Technology 1978.
Thesis: Dynamical Models for the Earth's Geoid.
- Sally Miranda Rigden (*Geology*) B.Sc., Australian National University 1977; M.S., California Institute of Technology 1981.
Thesis: The Determination of the Equation of State of Molten Silicates at High Pressures using Shock Wave Techniques.

DOCTOR OF PHILOSOPHY — *Continued*

David Bruce Sams (*Geochemistry*) B.S., University of California, Irvine 1977; M.S., California Institute of Technology 1980.

Thesis: U/Pb Zircon Geochronology, Petrology, and Structural Geology of the Crystalline Rocks of the Southernmost Sierra Nevada and Tehachapi Mountains, Kern County, California.

Ray James Weldon II (*Geology*) B.A., Pomona College 1977.

Thesis: The Late Cenozoic Geology of Cajon Pass; Implications for Tectonics and Sedimentation along the San Andreas Fault.

Daniel Wenkert (*Planetary Science and Astronomy*) B.A., Rice University 1977; M.S., California Institute of Technology 1981.

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

DIVISION OF THE HUMANITIES AND SOCIAL SCIENCES

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

Thesis: Signaling Games: Theory and Applications.

Paul Anders Bjorn (*Social Science*) B.A., University of Iowa 1976.

Thesis: Games in Econometrics with Applications to Labor Economics.

Da-Hsiang Donald Lien (*Social Science*) B.S., National Tsing-Hua University 1975; M.S., National Chiao-Tung University 1979.

Thesis: Essays on Speculation and Futures Markets.

DIVISION OF PHYSICS, MATHEMATICS AND ASTRONOMY

Ian Gareth Angus (*Physics*) B.S., Victoria University 1980; M.S., 1981.

Thesis: The $\Delta I = \frac{1}{2}$ Rule and the Strong Coupling Expansion.

Pierre Baldi (*Mathematics*) Maîtrise, Université Paris X 1980; Maîtrise, Université Paris VII 1980; D.E.A., Université Paris 1981; Diplôme d'Ingénieur, École Nationale Supérieure de Techniques Avancées 1983.

Thesis: I. On a Family of Generalized Colorings. II. Some Contributions to the Theory of Neural Networks. III. Embeddings of Ultrametric Spaces.

John Anthony Biretta (*Astronomy*) A.B., Thomas More College 1979.

Thesis: Investigations of Radio Jets in M87, 3C273, and 3C345.

Geoffrey Blewitt (*Physics*) B.S., Queen Mary College 1981.

Thesis: A Search for Free Proton Decay, and Nucleon Decay in O^{16} , using the Invariant Mass and Momentum of Exclusive Final States.

DOCTOR OF PHILOSOPHY — *Continued*

- Geoffrey Samuel Chesshire (*Applied Mathematics*) B.Sc., University of British Columbia 1980.
Thesis: Composite Grid Construction and Applications.
- David I. Feinstein (*Applied Mathematics*) B.S., California Institute of Technology 1979.
Thesis: Relating Thermodynamics to Information Theory: The Equality of Free Energy and Mutual Information.
- Tomas Paul Girnius (*Applied Mathematics*) B.A., Harvard College 1980.
Thesis: Ray Tracing in Complex Three-Dimensional Earth Models.
- Mark Howard Goroff (*Physics*) B.S., University of Connecticut 1980.
Thesis: The Ultraviolet Divergences of Einstein Gravity.
- Brian F. Hatfield (*Physics*) B.S., University of Minnesota 1977; M.S., University of California, Santa Cruz 1980.
Thesis: Gauge Fields in the Functional Schrödinger Representation.
- Chi Fai Ho (*Mathematics*) B.S., California State University, Hayward 1981.
Thesis: On Polynomial Invariants for Knots and Links.
- David Hans Hough (*Astronomy and Physics*) B.A., University of Pennsylvania 1980; M.S., California Institute of Technology 1984.
Thesis: Parsec-Scale Structure in the Nuclei of Double-Lobed Radio Quasars.
- Mark Alan Johnson (*Physics*) A.B., Washington University 1981.
Thesis: Concurrent Computation and Its Application to the Study of Melting in Two Dimensions.
- Adam Kolawa (*Physics*) M.S., University of Mining and Metallurgy 1981; M.S., Jagiellonian University 1982.
Thesis: Semianalytical Calculation of the O^{++} Glueball Mass in $Su(2)$ Gauge Theory.
- Sze-Keung Kwong (*Physics*) B.Sc., University of Hong Kong 1980; M.A., University of Southern California 1981.
Thesis: Theory and Applications of Wave-Mixings in Photorefractive Crystals.
- Geoffrey Blount Mills (*Physics*) B.A., University of Colorado, Boulder 1977.
Thesis: Charged Kaon Production in Tau Lepton Decays.
- Eric Daniel Mjølness (*Physics and Computer Science*) A.B., Washington University 1980.
Thesis: Neural Networks, Pattern Recognition, and Fingerprint Hallucination.
- Michael John Naughton (*Applied Mathematics*) B.Sc., University of Melbourne 1978; M.Sc., 1981.
Thesis: On Numerical Boundary Conditions for the Navier-Stokes Equations.
- Brian John Newport (*Physics*) B.Sc., Victoria University of Wellington 1979; B.Sc., (Honours) 1980.
Thesis: The Abundances of Ultraheavy Elements in the Cosmic Radiation.

DOCTOR OF PHILOSOPHY — *Continued*

- Volker Pönisch (*Physics*) Vordiplom, Universität Kiel 1979; M.S., Indiana University 1980.
Thesis: Subbarrier Fusion of the Oxygen Isotopes.
- Taje Indralall Ramsamujh (*Mathematics*) B.Sc., Imperial College of Science and Technology, University of London 1982; M.S., California Institute of Technology 1984.
Thesis: Some Topics in Descriptive Set Theory and Analysis.
- Robert Michael Rich (*Astronomy*) B.A., Pomona College 1979.
Thesis: Abundances and Kinematics of K Giants in the Galactic Nuclear Bulge.
- Leonid Zinovy Rivkin (*Physics*) B.A., Harvard College 1978.
Thesis: Damping Ring for the SLAC Linear Collider.
- David Kenneth Rollins (*Applied Mathematics*) B.Sc., University of British Columbia 1980.
Thesis: Diffusion with Varying Drag; The Runaway Problem.
- Joseph John Rushanan (*Mathematics*) B.S., M.S., The Ohio State University 1982.
Thesis: Topics in Integral Matrices and Abelian Group Codes.
- Run-Lie Shia (*Physics*) Tsinghua University 1979.
Thesis: Partially Coherent Wave Scattering and Radiative Transfer: An Integral Equation Approach.
- Michael Ben Weimer (*Physics*) S.B., Massachusetts Institute of Technology 1976; M.S., California Institute of Technology 1978.
Thesis: Thermal Desorption of Helium Films: Theory and Experiment.
- Hitoshi Yamamoto (*Physics*) B.S., Kyoto University 1974.
Thesis: A Study of Charged D^* Mesons Produced in e^+e^- Annihilations at $E_{\text{cm}}=29$ GeV.

Prizes and Awards

FREDERIC W. HINRICHS, JR., MEMORIAL AWARD

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

THE MILTON AND FRANCIS CLAUSER DOCTORAL PRIZE

Awarded to the Ph.D. candidate whose research is judged to exhibit the greatest degree of originality as evidenced by its potential for opening up new avenues of human thought and endeavor as well as by the ingenuity with which it has been carried out.
Recipient to be announced at Commencement.

THE WILLIAM F. BALLHAUS PRIZE

Awarded to aeronautics students for outstanding doctoral dissertations.
Harry Francis Robey III

MABEL BECKMAN PRIZE

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

ERIC TEMPLE BELL UNDERGRADUATE MATHEMATICS RESEARCH PRIZE

Awarded to one or more juniors or seniors for outstanding original research in mathematics.
Arthur Duval, senior; Everett W. Howe, senior

CALTECH PRIZE SCHOLARSHIPS AND CARNATION SCHOLARSHIPS

Each year Caltech awards these prizes for academic excellence. They are based solely on merit (selection is made on the basis of grades, faculty recommendations, and demonstrated research productivity) with no consideration given to need or any other nonacademic criteria. Listed below are graduating seniors who have been recipients of these prizes.

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

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

PRIZES AND AWARDS — *Continued*

DONALD S. CLARK MEMORIAL AWARDS

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

1986 *Randy D. Brown, junior; Pamela C. Feldman, junior*

1985 *Johannes P. Schmidt**

DEANS' CUP AND MASTERS' CUP

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

Joy Kimi Watanabe, Deans' Cup

Edward Nabeel George, Masters' Cup

LAWRENCE L. AND AUDREY W. FERGUSON PRIZE

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

Recipient to be announced at Commencement.

HAREN LEE FISHER MEMORIAL AWARD IN JUNIOR PHYSICS

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

1986 *Randall D. Kamien*

1985 *Taylor W. Lawrence**

HENRY FORD II SCHOLAR AWARD

Awarded either to the engineering student with the best academic record at the end of the third year of undergraduate study, or to the engineering student with the best first-year record in the graduate program.

1986 *David E. Long, junior*

1985 *Myles A. Sussman**

JACK E. 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.

1986 *Peter Leslie Cho*

1985 *James T. Liu**

GEORGE W. GREEN MEMORIAL PRIZE

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

1986 *Everett William Howe, senior*

1985 *John T. Fourkas**

PRIZES AND AWARDS — *Continued*

ARIE J. HAAGEN-SMIT MEMORIAL AWARD

Awarded to a sophomore or junior in biology or chemistry who has shown academic promise and who has made recognized contributions to Caltech.

1986 *Susannah Joy Hannaford, junior*

1985 *Robin K. Wilson**

ARTUR MAGER PRIZE IN ENGINEERING

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

Derrick H. Nguyen

THE HERBERT NEWBY McCOY AWARD

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

Gregory A. Voth

MARY A. EARL MCKINNEY PRIZE IN LITERATURE

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

Timothy P. Allen, junior; Joseph Francis, junior

ROBERT L. NOLAND LEADERSHIP SCHOLARSHIP

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

1986 *Peter D. Ashcroft, senior; Frank E. Kragh, senior*

1985 *Tammy L. Choy**

THE RODMAN W. PAUL PRIZE

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

Paul G. Gillespie

THE ROYAL SOCIETY FOR THE ENCOURAGEMENT OF ARTS MANUFACTURES AND COMMERCE SILVER MEDAL

Awarded to students who are receiving their first degrees from the most important institutions of learning in the United States. Winners are selected on the basis of outstanding academic records and significant participation in student activities.

Myles Andrew Sussman

HERBERT J. RYSER MEMORIAL SCHOLARSHIPS

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

Eric Babson, sophomore; John Simpson, junior

PRIZES AND AWARDS — *Continued*

THE ERNEST E. SECHLER MEMORIAL AWARD IN AERONAUTICS

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

Peter David Washbaugh

DON SHEPARD AWARD

Awarded to students who would find it difficult, without additional financial help, to engage in extracurricular and cultural activities. The recipients are selected on the basis of their capacity to take advantage of and to profit from these activities rather than on the basis of their scholastic standing.

1986 *James F. Bell, junior; Keith J. Owens, sophomore;*

Robert W. Soderbery, sophomore

1985 *Brian D. Metscher**

SIGMA XI AWARD

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

Salman Mitha

JOHN STAGER STEMPLE MEMORIAL PRIZE IN PHYSICS

Awarded to a graduate student in physics for outstanding progress in research as demonstrated by an excellent performance on the oral Ph.D. candidacy examination.

1985 *Roger W. Romani*

THE MORGAN WARD PRIZE

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

Eric Babson, sophomore