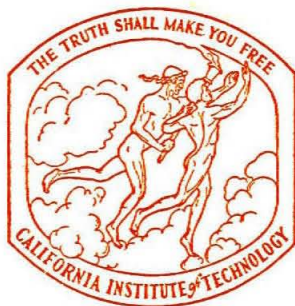


CALIFORNIA INSTITUTE OF TECHNOLOGY

Sixty-third Annual
**COMMENCEMENT
EXERCISES**



*Friday afternoon
June seventh, nineteen fifty-seven
at four-thirty o'clock*

ACADEMIC PROCESSION

Chief Marshal: HARVEY EAGLESON, Ph.D.

Assistant Marshals: DONALD S. CLARK, Ph.D.

JAMES C. DAVIES, Ph.D.

RODMAN W. PAUL, Ph.D.

Division I

CANDIDATES FOR THE DEGREE OF BACHELOR OF SCIENCE

CANDIDATES FOR THE DEGREE OF
MASTER OF SCIENCE IN SCIENCE

CANDIDATES FOR THE DEGREE OF
MASTER OF SCIENCE IN ENGINEERING

CANDIDATES FOR THE ENGINEER'S DEGREE

CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Division II

THE FACULTY OF THE CALIFORNIA INSTITUTE

THE CHAIRMEN OF DIVISIONS
AND DIRECTORS OF LABORATORIES

THE TRUSTEES OF THE CALIFORNIA INSTITUTE

THE REPRESENTATIVE OF THE UNITED STATES AIR FORCE

THE COMMENCEMENT CHAPLAIN

THE PRESIDENT OF THE CALIFORNIA INSTITUTE

THE CHAIRMAN OF THE BOARD OF TRUSTEES

PROGRAM

Presiding: ALBERT B. RUDDOCK, B.A., M.A.
Chairman of the Board of Trustees

PRELUDE AND PROCESSIONAL MARCH

Organist: JAMES H. SHEARER, A.R.C.M., A.R.C.O.

INVOCATION

THE REVEREND JOHN H. BURT, B.D.
All Saints Church of Pasadena

COMMENCEMENT ADDRESS

“The World at Our Door”

LEE A. DuBRIDGE, Ph.D., Sc.D., LL.D.
President of the California Institute of Technology

PROGRAM—*continued*

CONFERRING OF DEGREES

PRESIDENT DuBRIDGE

PRESENTATION OF CANDIDATES FOR DEGREES

For the degree of Bachelor of Science, by

PAUL CONANT EATON, A.M.

Dean of Students

For the degree of Master of Science in Science, by

WILLIAM R. SMYTHE, Ph.D.

Chairman of the Committee on the Course in Science

For the degree of Master of Science in Engineering, by

DONALD ELLIS HUDSON, Ph.D.

Chairman of the Committee on the Course in Engineering

For the engineer's degree, by

FREDERIC BOHNENBLUST, Ph.D.

Dean of Graduate Studies

For the degree of Doctor of Philosophy, by

DEAN BOHNENBLUST

PROGRAM—*continued*

COMMISSIONING OF AIR FORCE RESERVE OFFICERS

Presentation of Cadets

LIEUTENANT COLONEL LYLE F. JOHNSTON, B.S.

Professor of Air Science and Tactics

Oath of Office and award of Certificate of Commission as

Second Lieutenant in the Air Force Reserve, by

MAJOR GENERAL JACK W. WOOD

United States Air Force

ANNOUNCEMENTS

PRESIDENT DUBRIDGE

BENEDICTION

THE REVEREND MR. BURT

The audience is requested to remain standing until

the end of the Recessional March

RECESSIONAL MARCH

Candidates for Degrees

BACHELOR OF SCIENCE IN SCIENCE

Charles Hammond Anderson, Briarcliff Manor, New York. *Physics; Academic Honor.*

Eugene Myron Barston, North Hollywood, California. *Physics; Academic Honor.*

Michael Nathaniel Bleicher, Omaha, Nebraska. *Mathematics; Honor Key.*

Baird Holmes Brandow, Vista, California. *Physics; Academic Honor.*

Gary Yale Breitbard, San Diego, California. *Mathematics.*

David Brust, Los Angeles, California. *Physics.*

Roger William Caputi, Burbank, California. *Chemistry.*

Robert P. Chambers, Pasadena, California. *Applied Chemistry; Academic Honor.*

Giles Roy Cokelet, Arcadia, California. *Applied Chemistry; Academic Honor.*

Peter Linton Crawley, Pasadena, California. *Mathematics; Academic Honor.*

Robert C. Curley, Inglewood, California. *Applied Chemistry.*

Robert Joseph Deffeyes, Casper, Wyoming. *Applied Chemistry.*

Michael B. Duke, Los Angeles, California. *Geology.*

Alan Edward Farley, San Clemente, California. *Mathematics.*

Charles M. Finley, Lincoln, Nebraska. *Applied Chemistry; Honor Key.*

Warren Akira Furumoto, Honolulu, Hawaii. *Biology.*

Peter Paul Gaspar, Beverly Hills, California. *Chemistry.*

Thomas Emmett Gibson, Jr., Glendale, California. *Physics.*

Charles Vincent Goebel, Jr., Harrington Park, New Jersey. *Chemistry.*

Allan Morris Goldberg, Los Angeles, California. *Applied Chemistry.*

Lawrence Stone Griffith, Pasadena, California. *Geology.*

Richard O'Neil Hundley, Joliet, Illinois. *Physics; Academic Honor.*

Peter Colin Hans Jordan, Los Angeles, California. *Chemistry; Academic Honor.*

Richard Leo Kaufmann, Los Gatos, California. *Chemistry.*

Kanau Kawashima, Yokohama, Japan. *Physics.*

Gerald Klaz, Los Angeles, California. *Applied Chemistry; Academic Honor.*

Frank Joseph Kofsky, Los Angeles, California. *Physics; Honor Key.*

Wonyong Lee, Seoul, Korea. *Physics.*

Truman Edward Long, Los Angeles, California. *Biology; Academic Honor.*

Daniel Rutchik Mack, Sherman Oaks, California. *Physics; Academic Honor.*

Laurence Boyd Marantz, Los Angeles, California. *Chemistry.*

J. Howard Marshall III, Lake Arrowhead, California. *Physics; Academic Honor.*

ACADEMIC HONOR: *Graduated with scholastic honor in accordance with a vote of the Faculty.*

HONOR KEY: *Awarded by the Associated Students, CIT, for participation in student activities.*

BACHELOR OF SCIENCE IN SCIENCE

- Donald Theodore Meyer, Princeton, Illinois. *Physics*.
- Richard Warren Michie, Glendale, California. *Physics; Academic Honor*.
- William Alfred Moeur, Jr., Pasadena, California. *Applied Chemistry*.
- Charles Horton Mosher, Scotia, New York. *Physics*.
- Bernard H. Mueller, Running Springs, California. *Physics*.
- Donald Peter Nierlich, Santa Monica, California. *Biology; Honor Key*.
- Robert Henry Norton, Bethany, Connecticut. *Astronomy*.
- Walter Anton Petersen, Jr., Portland, Oregon. *Physics; Honor Key*.
- John William Pross, Jr., Monrovia, California. *Physics; Academic Honor*.
- Seymour Alvin Rapaport, Los Angeles, California. *Physics; Academic Honor*.
- Anton Stuart Richert, Wichita, Kansas. *Physics; Academic Honor*.
- Jon Robinson, Pasadena, California. *Applied Chemistry*.
- Edwin Bosonetto Royce, Pasadena, California. *Physics; Academic Honor*.
- Howard C. Rumsey, Jr., Bell, California. *Mathematics; Academic Honor*.
- Harrison Hagan Schmitt, Silver City, New Mexico. *Geology*.
- James Maurice Short, Kansas City, Kansas. *Chemistry*.
- Attila Imre Simanyi, Detroit, Michigan. *Physics; Academic Honor*.
- John Oliver Stevens, Santa Barbara, California. *Chemistry*.
- Joseph Edward Stuteville, Hawthorne, California. *Physics*.
- Martin Charles Tangora, Evanston, Illinois. *Mathematics; Academic Honor, Honor Key*.
- John Rhodes Thomas, Portage, Washington. *Physics; Academic Honor*.
- Robert Jackson Tuttle, Pasadena, California. *Physics*.
- John Roger Velman, Fontana, California. *Mathematics*.
- Raymond Virzi, Los Angeles, California. *Physics*.
- James Gerald Welsh, Tacoma, Washington. *Geochemistry*.
- Ray Henry White, Sherman Oaks, California. *Physics*.
- Robert LeRoy Wildey, Sierra Madre, California. *Astronomy*.
- David Eugene Yount, Scottsdale, Arizona. *Physics; Academic Honor*.

BACHELOR OF SCIENCE IN ENGINEERING

Peter Kendall Abbey, San Diego, California. *Electrical Engineering.*
James D. Acord, Altadena, California. *Electrical Engineering.*
Donn Anthony Allen, Pasadena, California. *Electrical Engineering; Academic Honor.*
Richard Scott Alvarez, San Francisco, California. *Electrical Engineering.*
Edwin "X" Berry, Sacramento, California. *Electrical Engineering.*
Howard Warren Bloomberg, Portland, Oregon. *Mechanical Engineering; Honor Key.*
John William Burrow, Jr., Whittier, California. *Electrical Engineering.*
Thomas Walter Cooper, Gardena, California. *Civil Engineering.*
Arthur Wm. Crowell, Monrovia, California. *Electrical Engineering.*
C. Harold Dale, Jr., Manhattan Beach, California. *Mechanical Engineering.*
Harold Ralph Dessau, Encino, California. *Electrical Engineering; Academic Honor.*
Ronald Frank Dettling, Lincoln, California. *Mechanical Engineering.*
Gary Neil Dietrich, Butte, Montana. *Civil Engineering.*
William Henry Dietrich, Morristown, New Jersey. *Mechanical Engineering; Honor Key.*
Thomas Spaulding Dodge, Austin, Texas. *Mechanical Engineering.*
Jerry Wilson Eggleston, Fullerton, California. *Civil Engineering.*
Duane Donald Erway, Pasadena, California. *Electrical Engineering.*
Charles Gordon Fullerton, Portland, Oregon. *Mechanical Engineering.*
Albert E. Gaede, Pasadena, California. *Mechanical Engineering.*
Robert Theodore Gelber, Los Angeles, California. *Mechanical Engineering.*
James Norval Giles, West Covina, California. *Electrical Engineering; Academic Honor.*
John Harvey Gliever, Van Nuys, California. *Electrical Engineering.*
Itiel Ike Haissman, Van Nuys, California. *Civil Engineering; Academic Honor.*
George Edwards Hall, Los Angeles, California. *Mechanical Engineering.*
James Ellis Hall, Abilene, Texas. *Mechanical Engineering.*
Jon Walter Harford, Colton, California. *Mechanical Engineering; Honor Key.*
Thomas Chandler Hays, North Hollywood, California. *Electrical Engineering.*
William Helge Hecht, Seattle, Washington. *Mechanical Engineering.*
Neil Hunter Herman, Pasadena, California. *Electrical Engineering; Academic Honor.*
Kirk Spearman Irwin, Los Angeles, California. *Mechanical Engineering; Academic Honor.*
Wilfred Dean Iwan, Altadena, California. *Mechanical Engineering; Academic Honor.*
Roy Albert Jensen, Merced, California. *Electrical Engineering.*
Theodore G. Johnson, Iron Mountain, Michigan. *Electrical Engineering; Honor Key.*
Paul Hamilton King, Glendale, California. *Civil Engineering.*
Theodore Edmund Lang, Pasadena, California. *Mechanical Engineering.*
Clarence Hilmer Larson, Jr., Altadena, California. *Electrical Engineering.*
Joe Edward Lingerfelt, Shelby, Montana. *Mechanical Engineering; Honor Key.*
Bernard Blas Lopez, Las Vegas, New Mexico. *Electrical Engineering.*
Jacob Lubliner, Los Angeles, California. *Civil Engineering; Academic Honor.*
Charles Andrew Luke, Bellingham, Washington. *Mechanical Engineering.*

BACHELOR OF SCIENCE IN ENGINEERING

- John Stevens Lukesh, Pasadena, California. *Mechanical Engineering.*
- Stephen Man-Far Mak, Kowloon, Hong Kong. *Electrical Engineering.*
- Marcy R. Malcolm, Jr., Glendale, California. *Mechanical Engineering.*
- Charles Leo Malone, Glendale, California. *Electrical Engineering.*
- Robert Racey Marshall, Pomona, California. *Electrical Engineering.*
- William True McDonald, North Bend, Oregon. *Electrical Engineering; Academic Honor, Honor Key.*
- Robert Taylor Moore, West Pittsburg, California. *Electrical Engineering; Academic Honor.*
- Peter Marc Allan Moretti, Santa Barbara, California. *Mechanical Engineering.*
- Reuben B. Moulton, Jr., Hanford, California. *Mechanical Engineering; Honor Key.*
- Edwin Donald Nelson, Los Angeles, California. *Electrical Engineering; Academic Honor.*
- Bruce Allen Nevelli, Portland, Oregon. *Mechanical Engineering.*
- R. Edward Park, Orange, California. *Civil Engineering; Honor Key.*
- John Walter Parks, San Francisco, California. *Mechanical Engineering.*
- Harry Patapoff, Monterey Park, California. *Electrical Engineering; Academic Honor.*
- Jerry Clifford Peck, Pasadena, California. *Mechanical Engineering.*
- Don Michael Pinkerton, Burbank, California. *Electrical Engineering.*
- Herbert Emil Rauch, Tucson, Ariz. *Electrical Engineering; Academic Honor, Honor Key.*
- Douglas Grant Ritchie, Escondido, California. *Mechanical Engineering.*
- Donald George Roberts, Glendale, California. *Electrical Engineering.*
- Fred Donald Russell, Denver, Colorado. *Electrical Engineering.*
- Danver Schuster, San Bernardino, California. *Electrical Engineering.*
- Bob Lee Simpson, Pasadena, California. *Electrical Engineering.*
- Richard Franklin Smisek, Los Angeles, California. *Mechanical Engineering.*
- James Henry Snyder, Pasadena, California. *Mechanical Engineering.*
- Thomas Christian Sorensen, Pasadena, California. *Electrical Engineering.*
- Luis Bertrand Soux, Potosi, Bolivia. *Electrical Engineering.*
- Walter Albert Specht, Jr., Long Beach, Calif. *Electrical Engineering; Academic Honor.*
- Roy Thorwald Stake, San Pedro, California. *Mechanical Engineering.*
- Robert Michael Staley, Whittier, California. *Electrical Engineering; Academic Honor.*
- Richard Douglas Stark, Spokane, Washington. *Electrical Engineering.*
- Jerold Lindsay Swedlow, Altadena, California. *Mechanical Engineering.*
- Leo Robert Talbot, La Crescenta, California. *Mechanical Engineering.*
- Stanley Grant Taylor, South Pasadena, California. *Mechanical Engineering.*
- Walter Frederick Weiss, Cochabamba, Bolivia. *Mechanical Engineering.*
- Clinton Leon West, Yuba City, California. *Mechanical Engineering.*
- Laurence Galen Whitlow, Pocatello, Idaho. *Mechanical Engineering; Honor Key.*
- John Arthur Wise, Beverly Hills, California. *Electrical Engineering.*
- James William Workman, Orange, California. *Mechanical Engineering; Academic Honor, Honor Key.*
- Cavour Wei-Hou Yeh, Los Angeles, California. *Electrical Engineering; Academic Honor.*

MASTER OF SCIENCE IN SCIENCE

Astronomy

Daniel Everett Harris. *B.S., Haverford College, 1956.*

Chemistry

William Thomas Brady, Jr. *B.A., Seton Hall University, 1954.*

William Day Hutchinson. *B.S., Morehouse College, 1955.*

Chemical Engineering

Myron Watt Black. *B.S., California Institute of Technology, 1956.*

Ronald Anderson Steven Brown. *B.S., University of Alberta, 1956.*

John Cleverley Carney. *B.S., California Institute of Technology, 1956.*

Ernest Joseph Franzgrote. *B.S., University of Notre Dame, 1952.*

Eric Arthur Johnson. *B.S., California Institute of Technology, 1956.*

Alexis I. Kaznoff. *B.S., University of California, 1956.*

Marcel Landrieau. *Dipl. d'Ing., École Centrale des Arts et Manufactures, 1956.*

William Joseph Lawrence. *B.S., University of Pennsylvania, 1953.*

André François Le Roy. *B.S., Yale University, 1956.*

Roy Ryosuke Sakaida. *B.S., University of California at Los Angeles, 1953.*

Lowell Melvin Schwartz. *S.B., Massachusetts Institute of Technology, 1956.*

Tom George Slinger. *B.S., California Institute of Technology, 1956.*

Gordon Ralph Wicker. *B.S., University of Wisconsin, 1953.*

Geology

Thomas Walter Bilhorn. *A.B., Washington University, 1952.*

James Ekstedt Conel. *B.A., Occidental College, 1955.*

Stanley Robert Hart. *S.B., Massachusetts Institute of Technology, 1956.*

John Holding Healy. *S.B., Massachusetts Institute of Technology, 1951.*

Charles Everett Helsley. *B.S., California Institute of Technology, 1956.*

Ralph Ottmar Kehle. *B.S., California Institute of Technology, 1956.*

Richard Leroy Nielsen. *B.S., California Institute of Technology, 1955.*

Robert Alan Seltzer. *B.S., University of Utah, 1953.*

Frederick Wortman Tahse, Jr. *B.S., Yale University, 1953.*

Geophysics

William Massee Chapple. *B.S., California Institute of Technology, 1956.*

T. Neil Davis. *B.S., University of Alaska, 1955.*

MASTER OF SCIENCE IN SCIENCE

Mathematics

Douglas B. Holdridge. *B.A., Fresno State College, 1955.*

Physics

Melvin Edward Conway. *B.S., Case Institute of Technology, 1955.*

Chadwick Schuyler Dauwalter. *B.S., California Institute of Technology, 1947.*

Franklin Painter Dixon. *B.S., University of Texas, 1954.*

William Farrell Edwards. *B.S., University of Utah, 1955.*

Archibald Howie. *B.Sc., University of Edinburgh, 1956.*

Elliot Leader. *B.Sc., University of the Witwatersrand, 1956.*

Paul Hersh Levine. *S.B., Massachusetts Institute of Technology, 1956.*

Philip M. Platzman. *S.B., Massachusetts Institute of Technology, 1956.*

Gerald Leslie Pollack. *B.S., Brooklyn College, 1954.*

Raymond Darden Powers. *B.S., University of Oklahoma, 1955.*

Richard Emery Skinner. *B.A., Reed College, 1955.*

Mih Yin. *B.S., Chiao Tung University, 1949.*

MASTER OF SCIENCE IN ENGINEERING

Aeronautics

George Francis Babits, Lt. Col., U.S.A.F. *B.S., United States Air Force Institute of Technology, 1956.*

Frank Borman, Capt., U.S.A.F. *B.S., United States Military Academy, 1950.*

Robert Lynn Chapkis. *B.S., California Institute of Technology, 1956.*

Walter H. Christiansen. *B.S., Carnegie Institute of Technology, 1956.*

Vincent Philippe Desormeaux. *Dipl. d'Ing., École Nationale Supérieure de l'Aéronautique, 1956.*

Bernard Martial Dufour. *Dipl. d'Ing., École Polytechnique, 1955.*

Anthony Averell duPont. *B.A., Yale University, 1955.*

Albert E. Gaede. *B.S., California Institute of Technology, 1957.*

Takeichi Goto. *B.S., Naval Engineering College of Japan, 1927.*

Frederick Charles Hall. *B.S., Agricultural and Mechanical College of Texas, 1951.*

Danny Frederick Huebner. *B.A.E., University of Minnesota, 1955.*

Herbert Erwin Hunter. *B.S., University of Maryland, 1956.*

Donald Sewell Lopez, Major, U.S.A.F. *B.S., United States Air Force Institute of Technology, 1956.*

Yen-mow Lynn. *B.S., National Taiwan University, 1956.*

A. Dean MacGillivray. *B.A., University of British Columbia, 1955; M.A., 1956.*

MASTER OF SCIENCE IN ENGINEERING

Aeronautics—continued

- Shigenori Jim Morizumi. *B.S., University of California, 1955.*
Makoto Nagano. *B.S., Rochester Institute of Technology, 1956.*
Haruo Oguro. *B.S., University of Tokyo, 1948.*
Richard Herman Petersen. *B.S., Purdue University, 1956.*
Jean Charles Poggi. *Dipl. d'Ing., École Polytechnique, 1955.*
Robert Wayne Prentice. *B.S., Georgia Institute of Technology, 1950.*
David Allison Russell. *B.S., University of Southern California, 1956.*
Robert Stanley Slizeski, Capt., U.S.A.F. *B.S., United States Military Academy, 1949.*
Leonard Dewey Stimpson, Jr. *B.A., Whittier College, 1949; M.A., University of California, 1951.*
Terrance Herman Tennant. *B.E., Yale University, 1956.*
Richard Ripley Tracy. *B.S., California Institute of Technology, 1952.*

Civil Engineering

- James Lamar Appleton, Jr., Lt., U.S.A. *B.S., United States Military Academy, 1953.*
Robert Eastman Ayers, Lt., U.S.A. *B.S., United States Military Academy, 1953.*
B. M. Basavaraj. *B.E., College of Engineering, Bangalore, 1953; Dipl. in Power Eng., Indian Institute of Science, 1955.*
John Frazer Brewer, Jr., Lt., U.S.A. *B.S., United States Military Academy, 1952.*
John Lewis Cannon, Lt., U.S.A. *B.S., United States Military Academy, 1952.*
Franklin Dale Dryden. *B.S., California Institute of Technology, 1954.*
Henry Augustus Flertzheim, Jr., Lt., U.S.A. *B.S., United States Military Academy, 1953.*
Arne Kalm. *B.S., California Institute of Technology, 1956.*
Alfred Francis Lawrence, Jr., Lt., U.S.A. *B.S., United States Military Academy, 1952.*
Pierre Lesgourgues. *Dipl. d'Ing., École Centrale des Arts et Manufactures, 1956.*
Paul Eugène McHorney, Jr. *B.S., California Institute of Technology, 1956.*
Gerald William Medsger, Capt., U.S.A. *B.S., United States Military Academy, 1948.*
Harry McKenzie Roper, Jr., Lt., U.S.A. *B.S., United States Military Academy, 1952.*
James Scarborough Sibley, Lt., U.S.A. *B.S., United States Military Academy, 1953.*
Charles Allen Wortley. *B.S., Antioch College, 1956.*

Electrical Engineering

- Richard Michael Aron. *B.S., Princeton University, 1956.*
Louis Matthew Bogdanovic. *B.S., California Institute of Technology, 1956.*
Robert Shivers Brown. *B.S., University of Minnesota, 1949.*
Alain Chaverebiere de Sal. *Dipl. d'Ing., École Polytechnique, 1953; Dipl. d'Ing., École Nationale Supérieure du Génie Maritime, 1956.*

MASTER OF SCIENCE IN ENGINEERING

Electrical Engineering—continued

- Michel Jacques Constanty. *Dipl. d'Ing., École Nationale Supérieure des Mines de Paris, 1956.*
- Allen Donald Diercks. *B.S., California Institute of Technology, 1956.*
- Aldo Gene DiLoreto. *B.S., California Institute of Technology, 1956.*
- John Fielding Edsforth. *B.E., McGill University, 1956.*
- Viktor Evtuhov. *B.S., University of California at Los Angeles, 1956.*
- Donald Charles Forster. *B.S., University of Southern California, 1955.*
- Robert Baxter Kohlmeier. *B.S., Michigan State College, 1955.*
- Alvin Waddell Ladd. *E.E., University of Cincinnati, 1955.*
- Paul Onni Lindfors. *B.S., California Institute of Technology, 1956.*
- Robert Manning McKeon. *B.S.E., Princeton University, 1956.*
- Carver A. Mead. *B.S., California Institute of Technology, 1956.*
- Walter Richard Menetrey. *B.S., California Institute of Technology, 1955.*
- Richard Stephen Muller. *M.E., Stevens Institute of Technology, 1955.*
- Robert Frederick Pramann. *B.S., United States Naval Academy, 1951.*
- Rudolf Alexander Schindler. *B.S., California Institute of Technology, 1956.*
- Curt Donald Schulze. *B.S., California Institute of Technology, 1956.*
- Gérard Claude Senouillet. *Dipl. d'Ing., École Polytechnique, 1953.*
- Rafn Stefánsson. *B.S., California Institute of Technology, 1956.*
- Kenneth Frank Steffan. *B.S., Missouri School of Mines and Metallurgy, 1956.*
- Jack Justin Stiffler. *B.S., Harvard College, 1956.*
- Gérard Jean Jacques Thevenon. *Dipl. d'Ing., École Supérieure d'Électricité, 1956.*
- Frederick Mackay Trapnell, Jr. *B.S., California Institute of Technology, 1956.*
- Truong Nguyen Tran. *B.S., California Institute of Technology, 1956.*
- Leon W. Zelby. *B.S., University of Pennsylvania, 1956.*

Mechanical Engineering

- Ross MacKenzie Brown. *B.S., California Institute of Technology, 1956.*
- Maurice Raymond Croutzeilles. *Dipl. d'Ing., École Nationale Supérieure des Mines de Paris, 1956.*
- Stanley V. Dawson. *B.S., Stanford University, 1953.*
- Everett Truman Eiselen. *B.S., California Institute of Technology, 1956.*
- George Louis Fletcher. *B.S., California Institute of Technology, 1956.*
- Albert Leonard Harbury. *B.A., University of California at Santa Barbara, 1953.*
- William Henry Heiser. *B.M.E., The Cooper Union for the Advancement of Science and Art, 1956.*
- Orval Elmer Jones. *B.S., Colorado Agricultural and Mechanical College, 1956.*

MASTER OF SCIENCE IN ENGINEERING

Mechanical Engineering—continued

- Robert Wendell Kermeen. *B.S., California Institute of Technology, 1949.*
James Reily Lloyd. *B.S., California Institute of Technology, 1956.*
Adolph Stephen Mager. *B.S., California Institute of Technology, 1956.*
Thomas Wayne Miller. *B.S., University of Washington, 1954.*
Dwight Alva Moberg. *B.S., University of Illinois, 1954.*
Charl Francois Naudé. *B.Sc., University of Stellenbosch, 1955.*
Hannu Outinen. *M.E., Finland Institute of Technology, 1953.*
Samuel Robinson Phillips. *B.S., California Institute of Technology, 1956.*
Thomas Roy Plambeck. *B.S., California Institute of Technology, 1956.*
Wolfgang Rockenhauser. *B.S., University of Wisconsin, 1956.*
William Jackman Schatz II. *B.S., Purdue University, 1956.*
Huntington Williams Small, Jr. *B.S., California Institute of Technology, 1956.*
William Ward Smith, Jr. *B.S., Purdue University, 1956.*
Charles William Stephens. *B.S., University of Kansas, 1953.*
Henry John Stumpf. *B.S., Newark College of Engineering, 1951.*
Maung Maung Thaug. *B.M.E., Polytechnic Institute of Brooklyn, 1956.*
André Aloïs Treyer. *Dipl. d'Ing., École Nationale Supérieure des Mines de Paris, 1956.*
Gerd Achim Tuchen. *Vordiplom, Technische Hochschule Dresden, 1954.*
John Campbell Uhthoff. *B.A.S., The University of British Columbia, 1949.*
Thomas Stephen Velky. *B.S., Stevens Institute of Technology, 1956.*
Muhip Abdurrahman Yeneriz. *B.S., University of Southern California, 1955.*

ENGINEER'S DEGREE

Aeronautical Engineer

Stanley Hammack Carpenter, Capt., U.S.M.C. *B.S., Tulane University, 1946.*

Benjamin Edgar Cummings. *B.S., California Institute of Technology, 1955; M.S., 1956.*

Donald Gordon Fraasa, Lt., U.S.N. *B.S., United States Naval Academy, 1950; B.S.Ae.E., United States Naval Postgraduate School, 1956.*

Ruben M. Gloria. *B.S., University of Maryland, 1951; M.S., California Institute of Technology, 1952.*

Donald James Harney, Capt., U.S.A.F. *M.S., California Institute of Technology, 1956.*

Robert Earl Oliver. *B.S., California Institute of Technology, 1952; M.S., 1954.*

Homer Keener Richards, Jr., Lt., U.S.N. *A.B., University of Redlands, 1948; B.S., United States Naval Postgraduate School, 1956.*

Glenn Allen Savage, Lt., U.S.N. *B.S., United States Naval Academy, 1947.*

Eugene Morgan Wisenbaker, Lt., U.S.N. *B.S., United States Naval Academy, 1950; B.S. Ae.E., United States Naval Postgraduate School, 1956.*

Chemical Engineer

Franklin Clark Silvey. *B.S., Montana State College, 1951; M.S., 1953.*

Electrical Engineer

Tsao Hwa Kuo. *B.S., National Central University of China, 1944; M.S., University of Texas, 1949.*

Mechanical Engineer

Milton Kamins. *S.B., Massachusetts Institute of Technology, 1948; S.M., 1949.*

DOCTOR OF PHILOSOPHY

- George Ogden Abell (Astronomy and Physics). *B.S., California Institute of Technology, 1941; M.S., 1952.* Thesis: The Distribution of Rich Clusters of Galaxies.
- Thomas Hood Applewhite (Chemistry and Plant Physiology). *B.S., California Institute of Technology, 1953.* Thesis: I. Thiocarbamate Studies. II. Preliminary Investigations of the α -Chymotrypsin Catalyzed Hydrolysis of Acylated Amino Acid Esters. III. The α -Chymotrypsin Catalyzed Hydrolysis of Methyl Hippurate and of Benzoyl-L-valine Methyl Ester. IV. The Enzyme-Inhibitor Dissociation Constants of Some N-Acetyl Amino Acid N'-Methylamides.
- Marcel Albert Baluda (Virology and Chemistry). *B.S., University of Pittsburgh, 1951; M.S., 1953.* Thesis: Homologous Interference by Ultraviolet Inactivated Virus in Newcastle Disease Virus.
- Graydon D. Bell (Physics and Astronomy). *B.S., University of Kentucky, 1949; M.S., California Institute of Technology, 1951.* Thesis: Measurement of Absolute f-Values for the Iron Group Elements.
- David Maurice Benenson (Aeronautics). *S.B., Massachusetts Institute of Technology, 1950; M.S., California Institute of Technology, 1953.* Thesis: Characteristics of Propagating Stall in Axial-Flow Compressors.
- Alan Fredric Berndt (Chemistry and Physics). *B.Ch.E., The Cooper Union, 1953.* Thesis: Some Molecular Structures by Electron and X-ray Diffraction.
- James Henry Berrian, Lt., U.S.N., (Immunology and Embryology). *B.A., Oregon State College, 1948; M.A., 1950.* Thesis: The Immune Response in Homologous Transplantation.
- Lillian Elizabeth Bertani (Virology and Biochemistry). *B.S., University of Michigan, 1953.* Thesis: Studies on the Establishment of Lysogeny by Bacteriophage P2.
- Frederick Joseph Beutler (Engineering Science and Mathematics). *S.B., Massachusetts Institute of Technology, 1949; S.M., 1951.* Thesis: A Generalization of Wiener Optimum Filtering and Prediction.
- Robert L. Bixler (Chemistry and Chemical Engineering). *B.S., California Institute of Technology, 1953.* Thesis: I. The Synthesis of Pyridine and Pyridine 1-Oxide Substituted Alanine Derivatives. II. Preliminary Investigations of α -Chymotrypsin Catalyzed Hydrolyses of Acylated Amino Acid Esters at Low Enzyme Concentrations—Studies of Surface Effects. III. The Synthesis and Rate of Acetolysis of 1-Bicyclo [2.2.1] Heptylmethyl Tosylate.
- Gunnar Bodvarsson (Geophysics and Mathematics). *Dipl. Ing., Technische Hochschule (Berlin), 1943.* Thesis: Thermal Activity and Related Phenomena in Iceland.
- Albert Thomas Bottini (Chemistry and Plant Physiology). *B.S., University of California, 1954.* Thesis: I. Mechanisms for Liquid Phase Hydrolysis of Chlorobenzene and Halotoluenes. II. The Products from the Reaction of N-(2-Bromoallyl)-Ethylamine with Sodium Amide. III. The Nitrogen Inversion Frequency in Cyclic Imines. IV. The Nuclear Magnetic Resonance Spectrum of Feist's Acid.
- Don Louis Bunker (Chemistry and Physics). *B.S., Antioch College, 1953.* Thesis: Flash Photolysis and the Recombination of Iodine Atoms.
- Robert Erskine Cleland (Biochemistry and Genetics). *A.B., Oberlin College, 1953.* Thesis: The Hormonal Control of Cell Wall Properties.

DOCTOR OF PHILOSOPHY

- Charles William Cook (Physics and Mathematics). *A.B.*, *University of South Dakota*, 1951; *M.S.*, *California Institute of Technology*, 1954. Thesis: Alpha-Particles from B^{12} ; the Astrophysical Significance.
- Gordon Pryor Eaton (Geology and Geophysics). *B.A.*, *Wesleyan University*, 1951; *M.S.*, *California Institute of Technology*, 1953. Thesis: Miocene Volcanic Activity in Los Angeles Basin and Vicinity.
- Frank Eber Goddard, Jr. (Aeronautics and Mathematics). *S.B.*, *Massachusetts Institute of Technology*, 1937. Thesis: The Effect of Uniformly Distributed Roughness on Turbulent Skin Friction Drag at Supersonic Speeds.
- Gérard Grau (Geophysics and Electrical Engineering). *L.Sc.*, *University of Paris*, 1950; *Ing.*, *École Centrale des Arts et Manufactures (Paris)*, 1950; *Ing.*, *École Nationale Supérieure du Pétrole (Rueil-Malmaison)*, 1952. Thesis: I. On the Reflection of Plane Seismic Waves by Stratified Systems (Normal Incidence). II. The Determination of Seismic Velocities in Layers with Non-Parallel Interfaces.
- Joseph Matthew Green (Physics and Mathematics). *B.S.*, *California Institute of Technology*, 1949. Thesis: The Hydrodynamics of Spherical Cavities in the Neighborhood of a Rigid Plane.
- Fred Bassett Hagedorn (Physics and Mathematics). *B.S.*, *Iowa State College*, 1952. Thesis: The Elastic Scattering of Protons by N^{15} .
- Frederick Clay Harshbarger (Mechanical Engineering and Physics). *A.B.*, *Oberlin College*, 1952; *M.S.*, *California Institute of Technology*, 1953. Thesis: Physico-Chemical Processes Behind Shock Fronts.
- Frederic William Hartwig, Capt., U.S.A.F. (Ret.), (Aeronautics and Mathematics). *B.S.*, *United States Military Academy*, 1945; *M.S.*, *California Institute of Technology*, 1951; *A.E.*, 1952. Thesis: Experimental Heat Transfer Measurements on a Hemisphere Cylinder at Mach 7.8.
- Paul Francis Helfrey (Chemical Engineering and Chemistry). *B.S.*, *California Institute of Technology*, 1951; *M.S.*, 1952. Thesis: I. Preliminary Studies in the Application of a Ballistic Piston to Investigation of Chemical Reaction in the Nitrogen-Oxygen System. II. Isobaric Heat Capacities at Bubble Point of Pseudocumene and of n-Heptane.
- James Arnold Hendrickson (Mechanical Engineering and Physics). *B.S.*, *California Institute of Technology*, 1953; *M.S.*, 1954. Thesis: The Initiation of Yielding and Brittle Fracture in Annealed Mild Steel.
- John Amos Kadyk (Physics and Mathematics). *A.B.*, *Williams College*, 1952; *S.B.*, *Massachusetts Institute of Technology*, 1952. Thesis: A Cloud Chamber Study of Anomalous θ° Particles.
- Richard John Kerr (Chemistry and Biology). *B.S.*, *University of California at Los Angeles*, 1952. Thesis: I. Investigations of the α -Chymotrypsin Catalyzed Hydrolysis of Amino Acid Hydrazides. II. Synthesis of Amino Acid Derivatives. III. The Apparent Ionization Constants of a Series of Phenylalanine Derivatives.
- Toshi Kubota (Aeronautics and Mathematics). *B.E.*, *Tokyo University*, 1947; *M.S.*, *California Institute of Technology*, 1952. Thesis: Study of Flow Around Simple Bodies at Hypersonic Speeds.
- John Williams Lamperti (Mathematics and Philosophy). *B.S.*, *Haverford College*, 1953. Thesis: On the Asymptotic Behavior of Recurrent and 'Almost Recurrent' Events.

DOCTOR OF PHILOSOPHY

- Thomas William Layton (Physics and Mathematics). *B.S., California Institute of Technology, 1951*. Thesis: Acceleration of Cosmic Rays by Hydromagnetic Waves.
- Leo Charles Levitt (Physics and Mathematics). *B.S., California Institute of Technology, 1941; M.S., Princeton University, 1947*. Thesis: Three Studies in Hydromagnetics.
- Kenneth Elmo Lohman (Paleontology and Geology). *B.S., California Institute of Technology, 1929; M.S., 1931*. Thesis: Cenozoic Nonmarine Diatoms from the Great Basin.
- Paul Alan Longwell (Chemical Engineering and Electrical Engineering). *B.S., California Institute of Technology, 1940; M.S., 1941*. Thesis: Chemical Reactions of Methane and of n-Hexane in Ballistic Piston Apparatus.
- Jon Mathews (Physics and Mathematics). *B.A., Pomona College, 1952*. Thesis: Application of Dispersion Relations to Proton Compton Scattering.
- William Scott McDonald (Physics and Mathematics). *B.S., Illinois Institute of Technology, 1950; M.S., 1951*. Thesis: Photoproduction of Neutral Pions from Hydrogen at Forward Angles from 240 to 480 Mev.
- James Paul McHugh (Chemistry and Physics). *B.S., Duquesne University, 1953*. Thesis: The Molecular Structures of Some Simple Olefins and Small Ring Compounds.
- Mark Frederick Meier (Geology and Engineering Science). *B.S., University of Iowa, 1949; M.S., 1951*. Thesis: Mode of Flow of Saskatchewan Glacier, Alberta, Canada.
- Matthew Stanley Meselson (Chemistry and Physics). *Ph.B., University of Chicago, 1951*. Thesis: I. Equilibrium Sedimentation of Macromolecules in Density Gradients with Application to the Study of Deoxyribonucleic Acid. II. The Crystal Structure of N, N'-Dimethyl Malonamide.
- Arthur Frederic Messiter, Jr. (Aeronautics and Mathematics). *B.Eng., Cornell University, 1952; M.Ae.Eng., 1953*. Thesis: Expansion Procedures and Similarity Laws for Transonic Flow.
- Arthur Miller (Chemistry and Mathematics). *B.S., Polytechnic Institute of Brooklyn, 1951*. Thesis: I. The Crystal Structure of the Intermetallic Compound $Mg_{12}Ce$. II. Reaction Products of gamma-Picoline and Iodine.
- Girair Mihran Nazarian (Chemistry and Physics). *B.S., Rutgers University, 1946; M.S., 1948*. Thesis: I. A Perturbation Theory of the Approach toward Sedimentation Equilibrium in the Ultracentrifuge and an Analysis of a Proposed Fast Method for Reaching Equilibrium. II. The Detailed Interpretation of the Anomalous Electron Diffraction Photographs of Some Symmetrical Gas Molecules with the Aid of Complex Scattering Amplitudes.
- Joseph Neustein (Mechanical Engineering and Physics). *B.S., University of Pittsburgh, 1943; M.S., Case Institute of Technology, 1946*. Thesis: Low Reynolds Number Experiments in an Axial Flow Turbomachine.
- William Burt Nichols (Chemical Engineering and Chemistry). *S.B., Massachusetts Institute of Technology, 1950; M.S., California Institute of Technology, 1954*. Thesis: I. An Apparatus for the Measurement of Liquid Diffusion Coefficients. II. Supersaturation in Hydrocarbon Systems: (1) n-Pentane in the Liquid Phase; (2) Statistical Procedures for Supersaturation Data. III. Volumetric and Phase Behavior of Hydrocarbon Systems: (1) Hydrogen-n-Hexane; (2) n-Heptane.
- Kenneth Harold Olsen (Physics and Astronomy). *B.S., Idaho State College, 1952; M.S., California Institute of Technology, 1954*. Thesis: Measurement of Relative gf-Values and Collisional Damping Constants for Spectral Lines of Neutral Calcium.

DOCTOR OF PHILOSOPHY

- Ralph Edward Pixley (Physics and Mathematics). *B.A., Drake University, 1951*. Thesis: The Reaction Cross Section for Protons on Nitrogen 14 from 220 to 600 kev.
- John Elmer Plapp (Mechanical Engineering and Physics). *B.S., The Rice Institute, 1950; M.S., California Institute of Technology, 1951*. Thesis: I. Laminar Boundary Layer Stability in Free Convection. II. Laminar Free Convection with Variable Fluid Properties.
- Josef Rabinowicz (Aeronautics and Physics). *B.S., Illinois Institute of Technology, 1953; M.S., California Institute of Technology, 1954*. Thesis: Aerodynamic Studies in the Shock Tube.
- Ronald LeRoy Richmond (Aeronautics and Physics). *B.S., University of California, 1952; M.S., California Institute of Technology, 1953*. Thesis: Experimental Investigation of Thick, Axially Symmetric Boundary Layers on Cylinders at Subsonic and Hypersonic Speeds.
- George Neal Richter (Chemical Engineering and Chemistry). *B.E., Yale University, 1951; M.S., California Institute of Technology, 1952*. Thesis: I. Thermal Conductivity of Nitrogen Dioxide in the Liquid Phase. II. Thermal Conductivity of Nitric Oxide. III. Viscosity of Nitrogen Dioxide and Nitrogen Dioxide-Nitric Oxide Mixtures.
- John Christian Ruckmick (Geology and Geochemistry). *B.A., Amherst College, 1952; M.S., California Institute of Technology, 1954*. Thesis: Ultramafic Intrusives and Associated Magnetite Deposits at Union Bay, Southeastern Alaska.
- James Crampton Savage (Geophysics and Physics). *B.S., University of Arizona, 1950*. Thesis: Wave Propagation in a Continuously Stratified Fluid.
- Haskell Shapiro (Electrical Engineering and Physics). *B.S., California Institute of Technology, 1942; M.S., 1947*. Thesis: Electromagnetic Scattering Properties of a Resonant Plasma.
- William Rodman Smythe (Physics and Mathematics). *B.S., California Institute of Technology, 1951; M.S., 1952*. Thesis: Recoil Protons from Meson Photoproduction in Hydrogen and Deuterium.
- Charles Andrew Swanson (Mathematics and Physics). *B.A., University of British Columbia, 1951; M.A., 1953*. Thesis: Asymptotic Expansions for Characteristic Values and Functions of a Second Order Ordinary Linear Differential Operator.
- William Junkichi Takei (Chemistry and Physics). *B.S., Illinois Institute of Technology, 1953*. Thesis: The Crystal Structures of Some Organic Compounds.
- Walter Rollier Thorson (Chemistry and Physics). *B.S., California Institute of Technology, 1953*. Thesis: Pressure Broadening in the Gamma-Bands of Nitric Oxide.
- David Beryle Wittry (Physics and Mathematics). *B.S., University of Wisconsin, 1951; M.S., California Institute of Technology, 1953*. Thesis: An Electron Probe for Local Analysis by Means of X-rays.
- Chi-hsiang Wong (Chemistry and Physics). *B.S., University of California at Los Angeles, 1953*. Thesis: The Study of a Crystal Structure by X-ray Diffraction and Some Molecular Structures by Electron Diffraction.
- William George Woods (Chemistry and Physics). *B.A., University of California at Los Angeles, 1953*. Thesis: I. Homoconjugation in Some 7-Chloronorbornane Derivatives. II. Electrostatic Effects in Some 7-Chloronorbornane Derivatives.

CANDIDATES FOR COMMISSIONS
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RESERVE OFFICERS' TRAINING CORPS

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**Distinguished Air Force Reserve Officers' Training Corps Graduates*

Prizes and Awards

FREDERIC W. HINRICHS, JR., MEMORIAL AWARD

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

(Recipient to be announced)

DON BAXTER, INC. PRIZES IN CHEMISTRY

Awarded to the two undergraduate students who during the year have carried out the best original researches in chemistry.

First prize: DENNIS G. PETERS

Second prize: PETER C. H. JORDAN

CONGER PEACE PRIZE ORATION

Established in 1912 by the late Everett D. Conger, D.D.

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INSTITUTE OF THE AERONAUTICAL SCIENCES SCHOLASTIC AWARD

Awarded to the student member of the I.A.S. attaining the best scholastic record in engineering or the physical sciences.

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Prizes and Awards—continued

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*Established in 1946 by the late Samuel P. McKinney, M.D.,
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First prize: MARTIN C. TANGORA

Second prize: DAVID E. YOUNT

Third prize: BRUCE T. MCKEEVER

Fourth prize: JOHN O. STEVENS

DON SHEPARD AWARD

*Awarded annually to one or more outstanding residents of the Student Houses in
order to pursue cultural opportunities which they might
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SIGMA XI AWARD

*Awarded in recognition of research work of exceptional quality by a graduate student. The nomination for the award, rotated among the Divisions, is made in 1957
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MARK F. MEIER

