

CALIFORNIA INSTITUTE OF TECHNOLOGY

Sixty-second Annual
COMMENCEMENT
EXERCISES



Friday afternoon
June eighth, nineteen fifty-six
at four-thirty o'clock

ACADEMIC PROCESSION

Chief Marshal: HARVEY EAGLESON, Ph.D.

Assistant Marshals: MELVIN D. BROCKIE, Ph.D.

DONALD S. CLARK, Ph.D.

JAMES C. DAVIES, 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 SPEAKER

THE COMMENCEMENT CHAPLAIN

THE CHAIRMAN OF THE BOARD OF TRUSTEES
THE PRESIDENT OF THE CALIFORNIA INSTITUTE

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 ALDEN S. MOSSHAMMER, D.D.
The First Congregational Church of Pasadena

COMMENCEMENT ADDRESS

“Science and Wisdom”

HENRY ALLEN MOE, L.H.D., LL.D., Litt.D.
Secretary-General
John Simon Guggenheim Memorial Foundation

PROGRAM—*continued*

CONFERRING OF DEGREES

LEE A. DuBRIDGE, Ph.D., Sc.D., LL.D.

President of the California Institute of Technology

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

JESSE L. GREENSTEIN, Ph.D.

Member 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

WILLIAM N. LACEY, Ph.D.

Dean of Graduate Studies

For the degree of Doctor of Philosophy, by

DEAN LACEY

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

CHARGE TO THE GRADUATING CLASS AND ANNOUNCEMENTS

PRESIDENT DuBRIDGE

BENEDICTION

THE REVEREND DR. MOSSHAMMER

The audience is requested to remain in their places until

the end of the Recessional March

RECESSIONAL MARCH

Candidates for Degrees

BACHELOR OF SCIENCE IN SCIENCE

Norman Webster Albright, Los Angeles, California. *Physics; Academic Honor.*
Harold Russell Almond, Jr., Warm Springs, California. *Chemistry; Academic Honor.*
James Stutsman Ball, Tempe, Arizona. *Physics; Academic Honor.*
Gene Alan Barnes, Arcadia, California. *Physics.*
Kyle David Bayes, Edmonds, Washington. *Chemistry; Academic Honor.*
Howard Curtis Berg, Iowa City, Iowa. *Chemistry; Academic Honor, Honor Key.*
Thomas Harold Bergeman, Fort Dodge, Iowa. *Chemistry; Academic Honor, Honor Key.*
Myron Watt Black, Spokane, Washington. *Applied Chemistry; Academic Honor, Honor Key.*
Stuart Wayne Bowen, Pasadena, California. *Physics.*
Robert Earl Bradford, Ontario, California. *Physics.*
David Geoffrey Cantor, La Mesa, California. *Physics.*
John Cleverley Carney, Seattle, Washington. *Applied Chemistry.*
William Massee Chapple, Billings, Montana. *Geophysics; Academic Honor.*
Richard Henry Clark, Arcadia, California. *Geology.*
Julian Scott Davidson, Glendale, California. *Applied Chemistry.*
Hubert Earl Dubb, Tujunga, California. *Chemistry.*
Eugene Ethan Epstein, Los Angeles, California. *Astronomy.*
Gerald Warren Freeman, Los Angeles, California. *Geology.*
Lyman Jefferson Fretwell, Jr., Tulsa, Oklahoma. *Physics; Academic Honor, Honor Key.*
James George Girard, Phoenix, Arizona. *Applied Chemistry.*
E. M. Gold, Los Angeles, California. *Mathematics; Academic Honor.*
Harold Mark Goldenberg, Los Angeles, California. *Physics; Academic Honor.*
Peter Gottlieb, Los Angeles, California. *Physics.*
Gerhard Ernest Hahne, Salt Lake City, Utah. *Physics; Academic Honor.*
Charles Everett Helsley, Vista, California. *Geology.*
John Llewelyn Howell, Rochester, Minnesota. *Biology.*
Eric Arthur Johnson, Valley Center, California. *Applied Chemistry.*
Arthur Akira Kamii, Los Angeles, California. *Biology.*
Robert Charles Kausen, Sacramento, California. *Applied Chemistry; Honor Key.*
Ralph Ottmar Kehle, Van Nuys, California. *Geology; Academic Honor.*
Milton Jay Kimmel, Terre Haute, Indiana. *Physics.*

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

- John K. Lansingh, Santa Clara, California. *Applied Chemistry*.
Kenneth Lee Laws, San Marino, California. *Physics*.
Donald Watson Lewis, Los Angeles, California. *Geology; Academic Honor*.
Duncan Edwards MacDuffie, Pasadena, California. *Chemistry; Academic Honor*.
Pierre Claude Mahieux, Beverly Hills, California. *Physics*.
John McKim Malville, San Francisco, California. *Physics*.
Donald Frank McAllister, Excelsior, Minnesota. *Physics*.
Delbert Charles McCune, Los Angeles, California. *Biology*.
John Martin Myers, Tempe, Arizona. *Physics*.
Eugene Allan Nelson, San Gabriel, California. *Geology*.
Charles Archie Norman, San Diego, California. *Geology*.
Raymond Lee Orbach, Los Angeles, California. *Physics; Academic Honor, Honor Key*.
Thomas Roy Plambeck, Baldwin Park, California. *Physics*.
Alan Mark Poisner, Kansas City, Missouri. *Chemistry*.
Richard Henry Pratt, Winslow, Washington. *Geology*.
William Kirkwood Purves, Jr., Sacramento, California. *Biology; Academic Honor, Honor Key*.
John David Rogers, Mayville, Wisconsin. *Physics*.
Charles S. Sargent, Jr., Los Angeles, California. *Physics*.
Robert Victor Sharp, Redondo Beach, California. *Geology*.
Tom George Slinger, Los Angeles, California. *Applied Chemistry*.
William N. Spence, Inglewood, California. *Mathematics*.
David Arthur Tansey, Los Angeles, California. *Applied Chemistry*.
Frederick Mackay Trapnell, Jr., Coronado, California. *Physics; Honor Key*.
John Carl Varady II, Pasadena, California. *Mathematics*.
Ronald Dean Wann, Los Angeles, California. *Physics*.
Raymond John Weymann, Los Angeles, California. *Astronomy; Academic Honor*.
Charles Edward Wheatley III, Burbank, California. *Physics*.
Fred Carl Witteborn, Whittier, California. *Physics*.
Tetsuo Yamane, Sao Paulo, Brazil. *Chemistry; Academic Honor*.
John Edward Young, Denver, Colorado. *Chemistry; Academic Honor, Honor Key*.

BACHELOR OF SCIENCE IN ENGINEERING

- Jan Louis Arps, Dallas, Texas. *Mechanical Engineering.*
- Arlen William Bell, San Gabriel, California. *Civil Engineering.*
- Frederic Nelson Benning, Santa Barbara, California. *Mechanical Engineering.*
- Charles A. Bodeen, Portland, Oregon. *Mechanical Engineering; Academic Honor, Honor Key.*
- Louis Matthew Bogdanovic, San Pedro, California. *Electrical Engineering.*
- Donald Craig Brooks, Los Angeles, California. *Electrical Engineering.*
- Ross MacKenzie Brown, Chicago, Illinois. *Mechanical Engineering.*
- Dale Richard Burger, Los Angeles, California. *Mechanical Engineering.*
- Robert Lynn Chapkis, Los Angeles, California. *Aeronautics.*
- Daniel Tanner Chilton, Hockessin, Delaware. *Mechanical Engineering.*
- Philip Ransom Conley, Fresno, California. *Mechanical Engineering; Honor Key.*
- James Lincoln Cowan, Los Angeles, California. *Civil Engineering.*
- Jeremy Freeman Crocker, Palm Springs, California. *Mechanical Engineering.*
- Dwight L. Dennis, Kentland, Indiana. *Mechanical Engineering.*
- Allen Donald Diercks, Los Angeles, California. *Electrical Engineering.*
- Aldo Gene DiLoreto, Rochester, New York. *Electrical Engineering; Academic Honor.*
- Everett Truman Eiselen, Stockton, California. *Mechanical Engineering; Academic Honor.*
- Rodney Lee Farris, Los Angeles, California. *Electrical Engineering.*
- George Louis Fletcher, Redlands, California. *Mechanical Engineering; Academic Honor, Honor Key.*
- Joseph Perkins Gibbs, Long Beach, California. *Mechanical Engineering.*
- Thomas L. Gunn, Los Angeles, California. *Electrical Engineering.*
- Edward Elver Hershberger, Pocatello, Idaho. *Civil Engineering; Academic Honor.*
- Robert Theodore Herzog, Los Angeles, California. *Mechanical Engineering.*
- James Leo Higgins, West Roxbury, Massachusetts. *Electrical Engineering.*
- Collis Huntington Holladay, Jr., San Marino, California. *Mechanical Engineering.*
- John Stewart Holland, Oakland, California. *Electrical Engineering.*
- Robert Irvin Jetter, San Marino, California. *Mechanical Engineering.*
- Byron Bethune Johnson, Jr., Waukegan, Illinois. *Civil Engineering.*
- Richard Alvin Johnson, Portland, Oregon. *Civil Engineering; Academic Honor, Honor Key.*
- Arne Kalm, Oakland, California. *Civil Engineering; Academic Honor, Honor Key.*
- Leon Morris Keer, Los Angeles, California. *Mechanical Engineering; Academic Honor.*
- James Henry Koontz, China Lake, California. *Mechanical Engineering.*
- Peter Owen Lauritzen, Rock Island, Illinois. *Electrical Engineering.*
- Paul Onni Lindfors, Freeport, Illinois. *Electrical Engineering; Academic Honor.*
- James Reily Lloyd, Cucamonga, California. *Mechanical Engineering; Academic Honor.*
- Thomas Ronald Lovejoy, Glendale, California. *Civil Engineering.*
- Adolph Stephen Mager, White Plains, New York. *Mechanical Engineering.*

BACHELOR OF SCIENCE IN ENGINEERING

Paul E. McHorney, Jr., San Diego, California. *Civil Engineering.*
Carver A. Mead, Auberry, California. *Electrical Engineering.*
Rolland George Moody, Granada Hills, California. *Mechanical Engineering.*
John Livingston Moser, Pasadena, California. *Electrical Engineering.*
John Martin Myers, Tempe, Arizona. *Electrical Engineering.*
John Lennox Nairn, Los Angeles, California. *Electrical Engineering.*
Stephen Hayward Nathanson, Tujunga, California. *Civil Engineering.*
Rex Bredesen Peters, Wilmington, California. *Mechanical Engineering; Academic Honor.*
Samuel Robinson Phillips, Washington, District of Columbia. *Mechanical Engineering.*
Jerry Ronald Pixton, La Mesa, California. *Electrical Engineering.*
John Elton Pollet, Los Angeles, California. *Civil Engineering.*
Gerald Leon Pressman, Glendale, California. *Electrical Engineering; Academic Honor.*
Gordon Stamm Reiter, Albuquerque, New Mexico. *Mechanical Engineering; Academic Honor.*
Ronald John Rockey, Los Angeles, California. *Electrical Engineering.*
Rudolf Alexander Schindler, Arcadia, California. *Electrical Engineering.*
Franklin Edward Schroeter, Kalispell, Montana. *Civil Engineering.*
Curt Donald Schulze, Burlingame, California. *Mechanical Engineering; Academic Honor.*
Donald Joseph Seldeen, Long Beach, California. *Electrical Engineering.*
Huntington Williams Small, Jr., Santa Barbara, California. *Mechanical Engineering; Academic Honor.*
Richard Hartley Small, Altadena, California. *Electrical Engineering; Academic Honor.*
Henry Hamilton Stair, El Paso, Texas. *Electrical Engineering.*
Rafn Stefansson, Reykjavik, Iceland. *Electrical Engineering.*
Joseph Keener Swindt, Coalinga, California. *Mechanical Engineering.*
Truong Nguyen Tran, Hue, Viet-Nam. *Electrical Engineering; Academic Honor.*
Richard Scott Van de Houten, Marengo, Illinois. *Electrical Engineering.*
Gerald George Vurek, Orinda, California. *Electrical Engineering.*
Roger Arlen Wileman, Fillmore, California. *Electrical Engineering.*

MASTER OF SCIENCE IN SCIENCE

Astronomy

Jacques Feige. *License-ès-Sciences, Université de Paris, 1955.*

Biology

Daniel Richard Morales. *B.S., University of San Francisco, 1955.*

Chemistry

James Thomas Bradbury III. *B.S., University of Kentucky, 1953.*

Konrad Walter Hubele. *B.S., University of California at Los Angeles, 1954.*

Chemical Engineering

Bern Donald Folkman. *B.S., California Institute of Technology, 1955.*

Thomas Pascoe Gordon. *A.B., Princeton University, 1954.*

Stanley Lawrence Grotch. *B.S., California Institute of Technology, 1955.*

Bernard Lee Mitchell. *B.S., Lamar State College of Technology, 1955.*

Hendrick Hunter Paalman. *B.S., California Institute of Technology, 1955.*

Terry Neal Thomas. *B.S., California Institute of Technology, 1953.*

Charles Herman Viens. *B.Ch.E., Rensselaer Polytechnic Institute, 1955.*

Geology

Kermit M. Bandt. *B.S., South Dakota School of Mines, 1954.*

David Barry Brooks. *B.S., Massachusetts Institute of Technology, 1955.*

Thomas Wallace Donnelly. *B.A., Cornell University, 1954.*

Marvin Alder Lanphere. *B.S., Montana School of Mines, 1955.*

Harry Lawrence. *A.B., Occidental College, 1955.*

Daniel Jeremy Milton. *B.A., Harvard University, 1954.*

Franz Adolf Schoennagel. *B.A., Northwestern University, 1955.*

Geophysics

Alfred Killebrew Orr, Jr. *B.S., University of the South, 1950.*

Mathematics

Robert Edward Haymond. *B.S., University of South Carolina, 1954.*

Charles Robson Storey, Jr. *B.S., Mississippi Southern College, 1954.*

MASTER OF SCIENCE IN SCIENCE

Physics

- Howard M. Brody. *S.B., Massachusetts Institute of Technology, 1954.*
Lawrence William Davis, Jr. *B.A., Pomona College, 1952.*
Lee Royce Gallagher. *B.S., University of Oklahoma, 1954.*
John Jay Merrill. *B.S., California Institute of Technology, 1955.*
Vincent Oliver Mowery. *B.E., Johns Hopkins University, 1954.*
Richard Kanne Sloan. *B.S., Pennsylvania State University, 1954.*
William Albert Steyert, Jr. *B.S., Massachusetts Institute of Technology, 1954.*

MASTER OF SCIENCE IN ENGINEERING

Aeronautics

- Alfred Edwin Andreoli. *B.S., University of Colorado, 1954.*
Dang Dinh Ang. *B.S., University of Kansas, 1955.*
Gordon Lawrence Cann. *B.S., University of Toronto, 1949.*
Pierre Albert Chagniot. *Ing. Civ. de l'Aéro., École Nationale Supérieure de l'Aéronautique, 1955.*
William Sang-One Chen. *B.S., Massachusetts Institute of Technology, 1952.*
Benjamin Edgar Cummings. *B.S., California Institute of Technology, 1955.*
Robert Wells Edwards. *B.S., University of Arizona, 1953.*
Jean-Paul Frignac. *Dipl. Ing., École Nationale d'Ingénieurs Arts et Métiers, 1955.*
André Fernand Garnault. *Dipl. Ing., École Polytechnique, 1952; Ing., École Nationale Supérieure de l'Aéronautique, 1955.*
John Angelos George. *B.S., Parks College of Aeronautical Technology, 1955.*
Alfred Mynderse Goldman, Jr. *B.S., California Institute of Technology, 1955.*
Donald James Harney. *United States Air Force Institute of Technology.*
Sander Herzfeld. *B.S., University of California, 1949.*
William Louis Marcy. *B.S., University of California at Los Angeles, 1953.*
Charles Neal McKinnon, Jr. *B.S., California Institute of Technology, 1955.*
Roy Rudolph Runk, Jr. *B.S., Louisiana State University, 1954.*
George Lindsay Shannon. *B.S., University of Texas, 1954.*
Ronald Oran Stearman. *B.S., Oklahoma Agricultural and Mechanical College, 1955.*
Bradford Sturtevant. *B.E., Yale University, 1955.*
Ellen Smith Thomas. *B.S., University of Oklahoma, 1952.*
Bruce Richard Walker. *B.S.M.E., University of Southern California, 1954.*

Civil Engineering

- Arthur Hadfield Blair, Capt., U.S.A. *B.S., United States Military Academy, 1950.*
John Richmond Brinkerhoff, Capt., U.S.A. *B.S., United States Military Academy, 1950.*

MASTER OF SCIENCE IN ENGINEERING

Civil Engineering—continued

- Mark Charles Carrigan, Major, U.S.A. B.S., *Louisiana State University*, 1942.
Frederick Joseph Hamlin, Jr., Capt., U.S.A. B.S., *United States Military Academy*, 1950.
David William Hill. B.S., *Duke University*, 1951.
Lyle N. Hoag, Jr. B.S., *California Institute of Technology*, 1949.
W. Hugh Jenkins, Jr., Capt., U.S.A. B.S., *United States Military Academy*, 1949.
James Laflin Kelly, Capt., U.S.A. B.S., *United States Military Academy*, 1950.
James Byron Kennedy. B.S., *United States Military Academy*, 1947.
John Fisher Kennedy. B.S., *University of Notre Dame*, 1955.
Gilbert William Kirby, Jr., Capt., U.S.A. B.S., *United States Military Academy*, 1949.
Moshe Kupfer. B.S., *University of California at Los Angeles*, 1955.
George Hobart McDonald, Jr. B.S., *California Institute of Technology*, 1955.
Samuel F. Middlebrook. B.S., *California Institute of Technology*, 1952.
Charles Osiris Peinado. B.E., *Johns Hopkins University*, 1955.
David Page Pettit, Capt., U.S.A. B.S., *United States Military Academy*, 1950.
Albert Leo Romaneski, Capt., U.S.A. B.S., *United States Military Academy*, 1950.
St. Clair Streett, Jr., Capt., U.S.A. B.S., *United States Military Academy*, 1949.
Sanford Tandowsky. B.S., *University of California*, 1953.

Electrical Engineering

- John Douglas Baugher. B.S., *California Institute of Technology*, 1952.
DeLano Alexander Brouillette. B.S., *California Institute of Technology*, 1955.
Lawrence S. Crane. B.S., *California Institute of Technology*, 1955.
Edward Maxwell Davis, Jr. B.S., *Carnegie Institute of Technology*, 1955.
Eugene Hunter Dryden. B.S., *California Institute of Technology*, 1955.
Ronald Joseph Hruby. B.S., *California Institute of Technology*, 1953.
Ronald Delano Kelly. B.S., *University of Pittsburgh*, 1955.
Antonios Nikolaou Kontaratos. S.B., *Massachusetts Institute of Technology*, 1955.
Hans Henry Kuehl. B.S.E., *Princeton University*, 1955.
Raymond Jean Lemettre. Dipl. Ing., *École Nationale Supérieure des Mines*, 1955.
Hugh Gaston Leney. B.S., *California Institute of Technology*, 1955.
James Joseph Mikulski. B.S., *Fournier Institute of Technology*, 1955.
Clarence Edward Miller, Jr. B.S., *California Institute of Technology*, 1953.
Rudolph Carl Parzl. B.S., *California Institute of Technology*, 1955.
Arthur Francis Pfeifer. B.E.S., *Marshall College*, 1953.
James Frederick Poage. B.S.E., *Princeton University*, 1955.
Robert Vernon Powell. B.S., *California Institute of Technology*, 1955.
Charles vanBleckingh Ray. B.E.E., *Cornell University*, 1952.
Gérard Robin. Dipl. Ing., *Université de Paris*, 1955.

MASTER OF SCIENCE IN ENGINEERING

Electrical Engineering—continued

Kenneth Erwin Stiefel. *B.S., University of Colorado, 1952.*

Iwao Sugai. *B.S., University of California at Los Angeles, 1955.*

Chung-Liang Tang. *B.S., University of Washington, 1955.*

Paul Keng-Chieh Wang. *B.S., California Institute of Technology, 1955.*

Walter Lee Whirry. *B.S., California Institute of Technology, 1955.*

Mechanical Engineering

Leon Hiram Bassett. *B.S., Worcester Polytechnic Institute, 1951.*

Laurence Ronald Beach. *B.S., Oregon State College, 1952.*

Wilmot Grant Brownlee. *B.Sc., Carleton College, 1951.*

William James Creighton, Jr. *B.S., California Institute of Technology, 1955.*

Pierre Auguste Eugene Dubois. *Dipl. Ing., École Polytechnique, 1952; Dipl. Ing., École Nationale Supérieure du Génie Maritime, 1955.*

Maurice Granier. *Dipl. Ing., École Polytechnique, 1952; Dipl. Ing., École Nationale Supérieure du Génie Maritime, 1955.*

Antonio Pedro Coutinho Lins. *Eng. de Aero., Instituto Tecnológico de Aeronautica, 1954.*

Gerald Zee Lippey. *B.S., California Institute of Technology, 1955.*

Frank Raymond Mastroly, Jr. *B.S., California Institute of Technology, 1955.*

James McCloud. *B.S., California Institute of Technology, 1955.*

Robert Charles Perpall. *B.S., California Institute of Technology, 1952.*

Richard Neiler Wagenseller. *B.S., California Institute of Technology, 1955.*

ENGINEER'S DEGREE

Aeronautical Engineer

- Lionel Eugene Ames, Lt., U.S.N. B.S., *United States Naval Academy*, 1947; B.S., *United States Naval Postgraduate School*, 1955.
- Eugene Newell Bennett, Major, U.S.M.C. B.S., *Oregon State College*, 1943; B.S., *United States Naval Postgraduate School*, 1955.
- John Warren Berry, Lt., U.S.N. B.S., *University of Washington*, 1947; B.S., *United States Naval Postgraduate School*, 1955.
- James Roger Foster, Lt., U.S.N. B.S., *United States Naval Academy*, 1949; B.S., *United States Naval Postgraduate School*, 1955.
- Joseph Norman Kanevsky, Lt., U.S.N. B.S., *United States Naval Academy*, 1949; B.S., *United States Naval Postgraduate School*, 1955.
- Reginald Montague Machell, Lt., U.S.N. B.S., *United States Naval Academy*, 1949; B.S., *United States Naval Postgraduate School*, 1955.
- Albert Gallatin Munson, B.S., *Louisiana State University*, 1951; M.S., *California Institute of Technology*, 1952.
- Henry John Nawoj, Lt., U.S.N. B.S., *University of New Hampshire*, 1948; B.S., *United States Merchant Marine Academy*, 1950; B.S., *United States Naval Postgraduate School*, 1955.
- William Theral O'Bryant, Commander, U.S.N. B.S., *United States Naval Academy*, 1941; B.S., *United States Naval Postgraduate School*, 1955.
- Merwin Sibulkin, B.S., *New York University*, 1948; M.S., *University of Maryland*, 1953.
- Jay J. Vermilya, Lt., U.S.N. B.S., *United States Naval Academy*, 1947; B.S., *United States Naval Postgraduate School*, 1955.

Civil Engineer

- Allan Conrad, B.C.E., *Rensselaer Polytechnic Institute*, 1952; M.S., *California Institute of Technology*, 1954.

Mechanical Engineer

- Prabandam Srinivasan, B.S., *Central College (India)*, 1942; B.E., *Mysore University (India)*, 1946; M.S., *Illinois Institute of Technology*, 1955.

DOCTOR OF PHILOSOPHY

- Douglas Robert Anderson (Mathematics and Aeronautics). *B.A., University of Minnesota, 1949; M.A., 1950*. Thesis: Invariant Measures on Groups.
- Leo Lon Baggerly (Physics, Mathematics and Philosophy). *B.S., California Institute of Technology, 1951; M.S., 1952*. Thesis: The Radioactive Decay of Iridium-192.
- Keith Albert Booman (Chemistry and Physics). *B.S., University of Washington, 1950*. Thesis: I. The Use of Numerical Methods in the Treatment of Data from Enzyme Kinetics Studies. II. The Effect of Enzyme Concentration on the Rate of a Reaction Catalyzed by *alpha*-Chymotrypsin.
- William W. Buchman (Electrical Engineering, Physics and Mathematics). *B.S., The City College of New York, 1951*. Thesis: Field Theory of Traveling-Wave Tubes with Loss; Application to the Study of Attenuator Saturation Effects.
- Eliot Andrew Butler (Chemistry and Physics). *B.S., California Institute of Technology, 1952*. Thesis: I. A System of Elemental Analysis. II. The Standard Potential of the Iodine-Iodine Monocyanide Half Cell. III. The Use of Thioacetamide for the Homogeneous Phase Precipitation of Inorganic Sulfides.
- George Stuart Campbell (Aeronautics and Mathematics). *B.S., Rensselaer Polytechnic Institute, 1947; B.Ae.E., 1949; M.S., California Institute of Technology, 1951*. Thesis: Turbulence in the Wake of a Thin Airfoil at Low Speeds.
- Forrest Lee Carter (Chemistry and Engineering Science). *B.A., Harvard College, 1951*. Thesis: Complexes of the Cuprous Halides with Dialkyl Acetylenes.
- Michael Cohen (Physics and Mathematics). *A.B., Cornell University, 1951*. Thesis: The Energy Spectrum of the Excitations in Liquid Helium.
- Donald Allen Dooley (Aeronautics and Physics). *B.S., University of Notre Dame, 1949; M.S., California Institute of Technology, 1950*. Thesis: Flame Stabilization on Streamlined Bodies.
- Joe Griffin Easley (Aeronautics and Physics). *B.S., St. Louis University, 1951; M.S., California Institute of Technology, 1952*. Thesis: Panel Flutter in Supersonic Flow.
- Robert George Ghirardelli (Chemistry and Mathematics). *B.S., University of San Francisco, 1952*. Thesis: I. The Stereochemistry of the Opening of the Imine Ring with Various Reagents. II. The Attempted Reduction of Naturally Occurring Threonine to 3-Amino-2-butanol.
- Elihu Goldish (Chemistry and Physics). *B.Sc., Marietta College, 1949*. Thesis: I. The Molecular Structures of Certain Organic Four-Membered Ring Compounds. II. The BaMg_9 Structure.
- Basil Gordon (Mathematics and Physics). *M.S., Johns Hopkins University, 1954*. Thesis: Some Tauberian Theorems Connected with the Prime Number Theorem.
- Roy Walter Gould (Physics and Electrical Engineering). *B.S., California Institute of Technology, 1949; M.S., Stanford University, 1950*. Thesis: I. Plasma Oscillations and Radio Noise from the Disturbed Sun. II. A Field Analysis of the M-Type Backward Wave Oscillator.
- Robert Joseph Hartlieb, Jr. (Aeronautics and Electrical Engineering). *B.E.Ph., Cornell University, 1952; M.A.E., 1953*. Thesis: The Cancellation of Random Disturbances in Automatic Control Systems.
- Eastman Nibley Hatch (Physics and Mathematics). *B.S., Stanford University, 1950*. Thesis: Nuclear Energy Levels in Tm^{169} and Lu^{175} .

DOCTOR OF PHILOSOPHY

- Leonard Arthur Herzenberg (Biochemistry and Immunology). *B.A., Brooklyn College, 1952*. Thesis: Studies on a Cytochrome Destroying System in *Neurospora*.
- William H. Hildemann (Genetics and Animal Physiology). *B.A., University of Southern California, 1950; M.S., 1951*. Thesis: Immunogenetic Studies of the Goldfish, *Carassius auratus*.
- Nan-Teh Hsu (Chemical Engineering and Geology). *B.S., University of Wisconsin, 1949*. Thesis: I. Local Convective Thermal Transfer from Spherical Surface. II. Temperature Gradients in Turbulent Gas Streams. Measurement of Temperature, Energy, and Pressure Gradients. III. Temperature Gradients in Turbulent Gas Streams. Behavior near Boundary in Two-Dimensional Flow.
- Floyd Bernard Humphrey (Chemistry and Physics). *B.S., California Institute of Technology, 1950*. Thesis: Studies in Paramagnetic Resonance.
- Norman Ford Jacobson (Chemistry and Mathematics). *B.S., California Institute of Technology, 1950*. Thesis: Studies in the Measurement of Nuclear Radiations of Extremely Low Intensities; Carbon 14 Dating.
- Robert Royce Johnson (Electrical Engineering and Physics). *B.S., University of Wisconsin, 1950; M.S., Yale University, 1951*. Thesis: An Electronic Digital Polynomial Root Extractor.
- Alan Robert Johnston (Physics and Electrical Engineering). *B.S., California Institute of Technology, 1952*. Thesis: Absolute Cosmic-Ray Ionization in the Atmosphere at Balloon Altitudes.
- Ralph William Kavanagh (Physics and Mathematics). *B.A., Reed College, 1950; M.A., University of Oregon, 1952*. Thesis: Scintillation and Magnetic Spectrometer Studies of Nuclear Reactions.
- James M. Kendall, Jr. (Aeronautics and Mathematics). *B.S., Carnegie Institute of Technology, 1951; M.S., California Institute of Technology, 1952*. Thesis: An Experimental Investigation of Leading Edge Shock Wave-Boundary Layer Interaction at Hypersonic Speeds.
- Jack Leo Kerrebrock (Mechanical Engineering and Physics). *B.S., Oregon State University, 1950; M.S., Yale University, 1951*. Thesis: The Interaction of Flow Discontinuities with Small Disturbances in a Compressible Fluid.
- Alfred George Knudson, Jr. (Biochemistry and Genetics). *B.S., California Institute of Technology, 1944; M.D., Columbia University, 1947*. Thesis: Histidine Metabolism in Liver.
- Karamcheti Krishnamurty (Aeronautics and Physics). *B.S., Benares Hindu University, 1946; Dipl. Ae.E., Indian Institute of Science, 1947; M.S., California Institute of Technology, 1952*. Thesis: Sound Radiation from Surface Cutouts in High Speed Flow.
- Philip Lamson (Aeronautics and Physics). *B.S., California Institute of Technology, 1948; M.S., University of Michigan, 1950*. Thesis: Measurements of Lift Fluctuations Due to Turbulence.
- Robert Leonard Lester (Biochemistry and Immunology). *B.S., Yale University, 1951*. Thesis: Incorporation of Amino Acids into the Proteins of *Micrococcus lysodeikticus*.
- Charles Alexander Lindley (Aeronautics and Physics). *B.Ae.E., Ohio State University, 1949; M.S., 1949*. Thesis: Secondary Flow in Compressor Cascades.

DOCTOR OF PHILOSOPHY

- John Francis Lovering (Geochemistry and Paleocology). *B.Sc., Sydney University, 1951; M.Sc., 1953*. Thesis: Structural and Compositional Studies on Selected Phases of Iron and Stony-Iron Meteorites with New Data Concerning the Origin of the Meteorites.
- Hardy Cross Martel (Electrical Engineering and Physics). *B.S., California Institute of Technology, 1949; M.S., 1950*. Thesis: An Investigation of the Omegatron Type Mass Spectrometer.
- Hugh Jack Martin, Jr. (Physics and Mathematics). *B.S., California Institute of Technology, 1951*. Thesis: Angular Correlation Experiments Involving the Compound Nucleus Ne^{20} .
- John Samuel Mathis (Astronomy and Physics). *S.B., Massachusetts Institute of Technology, 1949*. Thesis: The Ratio of Helium to Hydrogen in the Orion Nebula.
- Robert Lee Metzenberg, Jr. (Biochemistry and Chemistry). *B.A., Pomona College, 1951*. Thesis: Studies on the Biosynthesis of Aromatic Compounds in *Neurospora crassa*.
- Thomas Patrick Mitchell (Engineering Science and Physics). *B.Sc., University College (Galway, Ireland), 1950; M.Sc., 1952*. Thesis: I. The Propagation of Shock Waves in Non-Uniform Gases. II. The Stability of the Spherical Shape of a Vapor Cavity in Liquid.
- Howard F. Mower (Chemistry and Chemical Engineering). *B.S., California Institute of Technology, 1951*. Thesis: I. Studies on Mixed Anhydride Systems. II. Studies of the α -Chymotrypsin Catalyzed Hydrolysis of Specific Substrates.
- Forrest S. Mozer (Physics and Mathematics). *B.S., University of Nebraska, 1951; M.S., California Institute of Technology, 1953*. Thesis: Experimental Determination and Theoretical Analysis of the Elastic Scattering of Protons by Beryllium.
- Robert Nathan (Chemistry and Animal Physiology). *A.B., University of California, 1951*. Thesis: The Crystal Structures of Two Compounds: I. A Base Derived from Veatchine; II. α -Triglycine.
- George Nicolas Nomicos (Civil Engineering and Mathematics). *Dipl. C.E., National Technical University (Athens, Greece), 1945; M.S., University of Minnesota, 1952*. Thesis: Effects of Sediment Load on the Velocity Field and Friction Factor of Turbulent Flow in an Open Channel.
- Paul Eugene Peterson (Chemistry and Physics). *B.S., North Texas State College, 1951; M.S., 1952*. Thesis: I. Reactions of Phthaloylamino Acids; Modification of the Carboxyl Group of Amino Acid Derivatives. II. Derivatives of 3-Indolecarboxylic Acid. III. Metal Ion Complexes of Amidoximes; The Inhibition of the α -Chymotrypsin Catalyzed Hydrolysis of Nicotiny-L-Tyrosine Hydrazide by L- α -Acetamido- β -Phenyl-propionamidoxime.
- Francis James Petracek (Chemistry and Biology). *B.S., St. John's University (Collegeville, Minnesota), 1949; M.S., California Institute of Technology, 1951*. Thesis: Conversions of β -Carotene and Some Related Polyenes to Keto and Hydroxy Derivatives by Means of N-Bromosuccinimide and Boron Trifluoride.
- Don H. Pickrell, Jr. (Physics and Mathematics). *B.S., California Institute of Technology, 1949; M.S., 1950*. Thesis: A Study of Distortions in a Cloud Chamber.
- Walter Barclay Ray (Geology and Physics). *B.S., California Institute of Technology, 1952*. Thesis: The Crystal Structure of Zunyite.

DOCTOR OF PHILOSOPHY

- Scott Carson Rethorst (Aeronautics and Mathematics). *S.B., Massachusetts Institute of Technology, 1936; M.S., California Institute of Technology, 1950.* Thesis: Characteristics of an Airfoil Extending through a Circular Jet.
- Henry Leopold Richter, Jr. (Chemistry, Electrical Engineering and Physics). *B.S., California Institute of Technology, 1952.* Thesis: I. Hindered Rotation in Solid Hexaminecobalt(III) Chloride. II. Automatic Coulometric Titrations Involving an Amperometric End Point.
- Alexander Martin Rodriguez (Aeronautics and Mathematics). *B.S., University of Pittsburgh, 1948; M.S., California Institute of Technology, 1953.* Thesis: Theorems Concerning the Reduction of Drag for Supersonic Aircraft.
- Carl Albert Rouse (Physics and Mathematics). *B.S., Case Institute of Technology, 1951; M.S., California Institute of Technology, 1953.* Thesis: Proportional-Counter Selection of Cloud Chamber Events.
- Hector Rubalcava (Chemistry and Mathematics). *B.S., University of California, 1950.* Thesis: I. The Infrared Spectra and Structure of Cyanamide. II. The Infrared Spectra of Formamide, N, N-Dideuteroformamide, and N-Methyl Formamide.
- Sheldon Rubin (Mechanical Engineering and Physics). *B.S., California Institute of Technology, 1953; M.S., 1954.* Thesis: Transient Motion Measurements for Structural Response Analysis.
- Gordon Hisashi Sato (Biophysics and Physics). *B.A., University of Southern California, 1950.* Thesis: The Effect of Urea on Co-Factor Requiring Phage.
- Garry Lee Schott (Chemistry and Physics). *B.S., University of Michigan, 1952.* Thesis: Chemical Studies in Shock Waves.
- Robert Lee Shacklett (Physics and Mathematics). *B.A., Fresno State College, 1949; M.A., 1951.* Thesis: A Precision Measurement of the L_{II} - L_{III} X-Ray Energy Level Difference in Some Heavy Elements and a Comparison with the Predictions of the Schawlow-Townes Theory of the Nuclear Size Effect.
- Yung-Chung Shen (Aeronautics and Mathematics). *M.S., California Institute of Technology, 1952.* Thesis: Similarity Solution for Transonic Flow Past a Cone.
- Paul Joseph Shlichta (Chemistry, Physics and Geology). *B.S., University of Notre Dame, 1952.* Thesis: I. The Preparation and Configuration of Levorotatory 4,5-Dimethyl-1,3-dioxolane. II. Studies of Color Centers in Alkali Halide Crystals. III. A Structural Investigation of Strontium-Zinc System.
- Abe Sklar (Mathematics and Physics). *B.S., University of Chicago, 1947; M.S., 1948.* Thesis: Summation Formulas Associated with a Class of Dirichlet Series.
- George Irving Smith (Petrology and Paleontology). *B.A., Colby College, 1949; M.S., California Institute of Technology, 1951.* Thesis: Geology and Petrology of the Lava Mountains, San Bernardino County, California.
- Lee Meyers Sonneborn (Mathematics and Physics). *B.A., Oberlin College, 1951.* Thesis: Level Sets on Spheres.
- John David Sorrels (Physics and Mathematics). *S.B., Massachusetts Institute of Technology, 1950; M.A., The Rice Institute, 1951.* Thesis: I. A Λ Fragment Decay in a Cloud Chamber. II. Example of the Associated Production of a Negative Ξ and Two Neutral Θ Particles. III. A Study of Multiple V-Events.

DOCTOR OF PHILOSOPHY

- Terry Warren Spencer (Geophysics and Physics). *B.A., University of California at Los Angeles, 1951*. Thesis: Studies in Acoustic Pulse Propagation.
- Irving Carl Statler (Aeronautics and Mathematics). *B.S., University of Michigan, 1945*. Thesis: The Effects of Non-Stationary Aerodynamics on the Rigid-Body Dynamic Stability of an Airplane.
- Geronimo Terres, Jr. (Immunology and Animal Physiology). *B.A., Santa Barbara College, 1950; M.A., Stanford University, 1951*. Thesis: I. The Effect of Hydrogen Peroxide Oxidation on the Antigenicity of Ovalbumin, Bovine Serum Albumin, and Rabbit gamma Globulin. II. Cortical Discontinuity and Propagation of Spreading Depression.
- Paul On Pong Ts'o (Biochemistry and Chemistry). *B.S., Lingnan University (Canton, China), 1950; M.S., Michigan State College, 1951*. Thesis: On Plant Myosin.
- Roy Archie Whiteker (Chemistry and Physics). *B.S., University of California at Los Angeles, 1950; M.S., 1951*. Thesis: I. An Ion-Exchange Method for a Volumetric Determination of Sulfate. II. A Study of Iron(III) Sulfate Complex Ions. III. A Sodium Coulometer. IV. A Sodium-Ion Glass Electrode.
- Harry Edwin Williams (Mechanical Engineering and Physics). *B.S., University of Santa Clara, 1951; M.S., California Institute of Technology, 1952*. Thesis: Stresses and Strains in Cylindrical Shells.
- Fredrik Zachariassen (Physics and Mathematics). *B.S., University of Chicago, 1951*. Thesis: Photo Disintegration of the Deuteron.
- Gordon Everett Zima (Mechanical Engineering and Chemistry). *B.S., Stanford University, 1942; M.S., California Institute of Technology, 1952*. Thesis: Some High Temperature Oxidation Characteristics of Nickel with Chromium Additions.

Posthumous Award

- James Albert Cullen (Physics and Mathematics). *B.S., California Institute of Technology, 1946*. Thesis: On Fock's Theory of Diffraction.

CANDIDATES FOR COMMISSIONS
UNITED STATES AIR FORCE
RESERVE OFFICERS' TRAINING CORPS

Arlen W. Bell
Myron W. Black
Charles A. Bodeen
Stuart W. Bowen
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Richard A. Johnson
Paul O. Lindfors
Rex B. Peters
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Prizes and Awards

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: TETSUO YAMANE

Second prize: HOWARD C. BERG

CONGER PEACE PRIZE ORATION

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

First prize: HOWARD C. BERG

Second prize: REUBEN B. MOULTON

MARY A. EARLE McKINNEY PRIZE IN ENGLISH

Established in 1946 by the late Samuel P. McKinney, M.D., as a memorial to his mother.

First prize: DAN McMORRIS

Second prize: DOUGLASS L. CARMICHAEL

Third prize: TETSUO YAMANE

Fourth prize: DAVID E. YOUNT

DON SHEPARD AWARD

Awarded annually to one or more outstanding residents of the Student Houses in order to pursue cultural opportunities which they might otherwise not be able to enjoy.

BERNARD B. LOPEZ

WALTER F. WEISS

Prizes and Awards—continued

THOMAS HUNT MORGAN MEMORIAL AWARD

Made annually on recommendation of the Division of Biology to an outstanding graduate student in Biology receiving the degree of Doctor of Philosophy.

ROBERT L. METZENBERG, JR.

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 1956 by the Division of Civil, Electrical and Mechanical Engineering and Aeronautics.

JAMES M. KENDALL, JR.

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)

