

California Institute of Technology



Sixty-first Annual
COMMENCEMENT
EXERCISES

Friday afternoon
June tenth, nineteen fifty-five
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.

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

CHAIRMEN OF DIVISIONS
AND DIRECTORS OF LABORATORIES

THE TRUSTEES OF THE CALIFORNIA INSTITUTE
REPRESENTATIVE OF THE UNITED STATES AIR FORCE

THE COMMENCEMENT SPEAKER

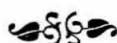
THE COMMENCEMENT CHAPLAIN

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 K. MORGAN EDWARDS, A.B., B.D., D.D.
The First Methodist Church of Pasadena

COMMENCEMENT ADDRESS

“Not They, but We”

CLARENCE B. RANDALL, LL.B., LL.D., D.Eng.
Chairman of the Board, Inland Steel Company

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

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

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 MR. EDWARDS

*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

- John Philip Andelin, Jr., *Physics, Academic Honor, Honor Key.*
Mervyn Lee Barman, *Physics.*
Alfred Angel Barrios, *Applied Chemistry.*
Gilbert Lawrence Beebower, *Applied Chemistry.*
William Arnold Berg, Jr., *Physics.*
Edward Michael Boughton, Jr., *Physics, Academic Honor, Honor Key.*
Carl O. Bowin, *Geology.*
Charles Jacob Brokaw, *Biology, Academic Honor.*
Chalon Lucius Carnahan, *Chemistry, Academic Honor.*
David Lester Crowther, *Physics, Academic Honor.*
Ernest Aaron Dernburg, *Biology.*
John Jacob Domingo, *Physics, Academic Honor.*
Ernest Dzenolet, *Biology.*
Lewis Francis Ellmore, *Physics.*
Eugene Engels, Jr., *Physics, Academic Honor.*
George Epstein, *Mathematics.*
Philip Joseph Ferrell, *Physics.*
Bern Donald Folkman, *Applied Chemistry.*
Harvey S. Frey, *Physics.*
Horace Wataru Furumoto, *Physics.*
Gary S. Gayron, *Physics, Academic Honor.*
Jay Arthur Glasel, *Chemistry, Academic Honor.*
Stanley Lawrence Grotch, *Applied Chemistry, Academic Honor.*
Walter Haenggi, *Geology.*
William Rubeck Hagemeier, *Physics.*
John Leonard Honsaker, *Physics, Academic Honor.*
Conrad Housley, *Geology.*
Richard Milton Jali, *Physics.*
Marion Alan Joncich, *Physics, Academic Honor.*
Albert John Lieber, *Physics.*
William Breckenridge Lindley, *Physics, Academic Honor.*
Oreste Woodbury Lombardi, *Geochemistry.*
Stanley Lawrence Manatt, *Chemistry, 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

- Vincent Anthony Marinkovich, *Physics, Honor Key.*
Frederick Martin, *Physics.*
Theodore Kerner Matthes, *Mathematics, Academic Honor.*
Edwin James Meacham, *Chemistry.*
Robert Francis Meade, *Geology.*
Walter Richard Menetrey, *Physics, Academic Honor.*
John Jay Merrill, *Physics, Academic Honor, Honor Key.*
F. Curtis Michel, *Physics, Academic Honor.*
Ralph Fraley Miles, Jr., *Physics, Academic Honor.*
Marco Roland Negrete, *Physics, Academic Honor.*
Richard Leroy Nielsen, *Geology.*
Thomas Wyatt Noonan, *Physics, Academic Honor.*
Hendrick Hunter Paalman, *Applied Chemistry, Academic Honor.*
Roy Wilmer Paul, Jr., *Mathematics.*
Richard John Piccolini, *Chemistry, Academic Honor.*
Richard Bradley Read, *Physics, Academic Honor.*
Donald Bruce Roberts, *Physics, Academic Honor, Honor Key.*
Jack Wilbur Rocchio, *Physics.*
Charles Spencer St. Clair, *Geology.*
Bernard Paul Schweitzer, *Physics, Honor Key.*
Edwin Burt Seidman, *Chemistry.*
Samuel John Sims, *Geology.*
Donald James Taylor, *Physics.*
Thomas Trilling, *Physics.*
James Stephen Tyler, *Applied Chemistry.*
Donald Arthur Vogel, *Biology.*
Martin Vogel, *Chemistry, Academic Honor.*
Richard Franklin Webber, *Physics, Academic Honor.*
John David Weisner, *Physics.*
John Harmon Wolfe, *Mathematics.*
Alva Fumihiko Yano, *Physics.*
Kenneth Ziedman, *Physics.*

BACHELOR OF SCIENCE IN ENGINEERING

- James Lowell Adams, *Mechanical Engineering, Academic Honor, Honor Key.*
John Edwin Ames, Jr., *Mechanical Engineering, Aeronautics.*
Francesco Gallatin Beuf, *Mechanical Engineering, Honor Key.*
Walter D. Biggers, *Mechanical Engineering.*
DeLano Alexander Brouillette, *Electrical Engineering, Academic Honor.*
John Arthur Bryant, *Mechanical Engineering.*
John Daniel Bush, *Mechanical Engineering.*
Vincenzo Maria Cestari, *Electrical Engineering.*
William Harold Chambers, Jr., *Mechanical Engineering.*
Robert Dale Christian, *Mechanical Engineering.*
Ronald Robert Cochran, *Mechanical Engineering.*
John William Converse, *Mechanical Engineering.*
Paul William Cramer, Jr., *Electrical Engineering.*
Lawrence S. Crane, *Electrical Engineering.*
William James Creighton, *Mechanical Engineering, Academic Honor.*
Benjamin Edgar Cummings, *Aeronautics, Academic Honor.*
Ronald Wayne Danklefs, *Mechanical Engineering.*
Eugene Hunter Dryden, *Electrical Engineering, Academic Honor.*
Alfred Mynderse Goldman, Jr., *Aeronautics.*
Joseph Ernest Graetch, *Mechanical Engineering.*
Raymond George Grieser, *Electrical Engineering, Honor Key.*
Daniel J. Griffin, Jr., *Electrical Engineering.*
William Bruce Haigler, *Mechanical Engineering.*
Leighton D. Hanon, Jr., *Mechanical Engineering.*
Paul Leroy Harrison, *Electrical Engineering.*
Alan Lee Helgesson, *Electrical Engineering, Academic Honor, Honor Key.*
Gerald Eugene Hooper, *Electrical Engineering.*
Carl Wesley Johnson, *Electrical Engineering.*
Louis Urs Kilchenman, *Electrical Engineering.*
Harold Robert Kramer, *Electrical Engineering.*
Roger Edwin Lagerquist, *Mechanical Engineering.*
William Frank Lapson, *Mechanical Engineering.*
Hugh Gaston Leney, *Electrical Engineering, Academic Honor.*
James Pettis Lewis, *Mechanical Engineering, Honor Key.*
Gerald Zee Lippey, *Aeronautics, Academic Honor.*
George Everette Madsen, *Civil Engineering, Academic Honor, Honor Key.*
Richard Addison Manley, *Mechanical Engineering.*
Frank Raymond Mastroly, Jr., *Mechanical Engineering.*
James McCloud, *Mechanical Engineering.*
George Hobart McDonald, Jr., *Civil Engineering, Academic Honor, Honor Key.*

BACHELOR OF SCIENCE IN ENGINEERING

- Charles Neal McKinnon, Jr., *Aeronautics*.
Miles Albin Nesman, *Aeronautics*.
Albert Loyd Nichols, Jr., *Mechanical Engineering*.
Earl Vern Nogle, *Electrical Engineering*.
Stanley Fraser Parkill, *Mechanical Engineering*.
Rudolph Carl Parzl, *Electrical Engineering*.
Robert Vernon Powell, *Electrical Engineering*.
James Gordon Robins, *Electrical Engineering*.
Jerrold Allen Royce, *Civil Engineering*.
Richard R. Schmid, *Civil Engineering*.
Charles Paul Shumate, *Mechanical Engineering*.
Rodney William Supple, *Mechanical Engineering, Honor Key*.
Thomas George Taussig, *Electrical Engineering*.
Alan J. Teague, *Mechanical Engineering*.
James Philip Wade, *Electrical Engineering*.
Richard Nieler Wagenseller, *Mechanical Engineering, Honor Key*.
Van Ian Walkley, *Civil Engineering*.
Frank Blakslee Wallace, Jr., *Mechanical Engineering, Honor Key*.
Paul Keng Chieh Wang, *Electrical Engineering, Academic Honor*.
Donald E. Welch, *Mechanical Engineering*.
Walter Lee Whirry, *Electrical Engineering, Academic Honor*.

MASTER OF SCIENCE IN SCIENCE

Astronomy

- William Geary Melbourne, *A.B., University of California, 1954*.
Ray Leon Newburn, Jr., *B.S., California Institute of Technology, 1954*.

Biology

- Toyoo Tomita, *M.S., Tohoku University, 1952*.

Chemistry

- James King, Jr., *B.S., Morehouse College, 1953*.

Chemical Engineering

- Paul Lincoln Armstrong, Jr., *B.S., California Institute of Technology, 1951*.
Jimmie Ronald Bowden, *B.S., University of Kansas, 1949*.
Ronald Taylor Caldwell, *B.S., California Institute of Technology, 1951*.
Manuel Jesús Crespo, *B.S., California Institute of Technology, 1953*.

MASTER OF SCIENCE IN SCIENCE

Chemical Engineering—continued

- Jean Garcin, *Dipl. Eng., École Centrale des Arts et Manufactures (Paris), 1954.*
Robin Neal Huntley, *B.S., California Institute of Technology, 1954.*
David Swarner Koons, *B.S., California Institute of Technology, 1952.*
Moises Levy, *B.S., California Institute of Technology, 1952.*
Robert Frederick Meldau, *B.S., University of California, 1950.*
Gordon Bruce Munn, *B.S., California Institute of Technology, 1954.*
Robert Gene Rinker, *B.S., Rose Polytechnic Institute, 1951.*
Gordon W. Whitaker, *B.S., Purdue University, 1951.*
Warren Carl Windham, *B.S., Lamar State College of Technology, 1954.*

Geology

- Lloyd Earl Best, *Geoph. Eng., Colorado School of Mines, 1952.*
Donald G. Bryant, *B.S., University of Arizona, 1954.*
Thomas B. Howes, *A.B., Knox College, 1943.*
Arthur E. Lewis, *B.S., St. Lawrence University, 1950.*
Bruce Owen Nolf, *B.A., State University of Iowa, 1954.*
Bimalendu Raychaudhuri, *B.Sc., Calcutta University, 1948; M.Sc., 1951.*
Arthur William Rose, *B.S., Antioch College, 1953.*
David McLean Wilson, *B.S.E., Princeton University, 1953.*
Donald Underkofler Wise, *B.S., Franklin and Marshall College, 1953.*

Geochemistry

- Henry Philip Schwarcz, *A.B., University of Chicago, 1952.*

Geophysics

- Donald James Marshall, *B.S., Massachusetts Institute of Technology, 1954.*
Clifton Richard Smith, *B.S., California Institute of Technology, 1954.*

Physics

- Arthur H. Muir, Jr., *B.A., Williams College, 1953.*
Henry Richard Myers, *B.S., Massachusetts Institute of Technology, 1954.*
Philip R. Snelgrove, *B.S., Brigham Young University, 1953.*
Terence Christopher Terman, *B.S., Stanford University, 1952.*
Walter D. Wales, *B.A., Carleton College, 1954.*

MASTER OF SCIENCE IN ENGINEERING

Aeronautics

- David Harris Campbell, B.S., *Queens University, 1954.*
Luciano Cavalcante, B.S., *Rensselaer Polytechnic Institute, 1953.*
Bernard Antoine Darrieus, *Ing. Civil de Ae., École Nationale Supérieure de l'Aéronautique, 1954.*
Alvin Lyone Fehrman, Capt., U.S.A.F., B.E., *Vanderbilt University, 1947.*
Terrell Wallace Feistel, B.S., *California Institute of Technology, 1954.*
Charles Robert Hamilton, *Dipl. Ae., University of Bucharest, 1952.*
Keith Larsen Henrie, B.S., *University of California, 1954.*
Arthur Charles Heyman, B.A.E., *New York University, 1954.*
Homer Harvey Howell, Jr., B.S., *U.S.A.F. Institute of Technology, 1951.*
George Thomas James, Jr., Capt., U.S.A.F., B.S., *Purdue University, 1949.*
Peter Barry Stuart Lissaman, B.S., *Natal University of South Africa, 1951.*
Robert Martin Pedraglia, B.S., *California Institute of Technology, 1948.*
Sigmund Marvin Redelsheimer, B.Ae.E., *Alabama Polytechnic Institute, 1951.*
Kenneth William Rogers, B.S., *University of Wyoming, 1950.*
George Stalk, Capt., U.S.A.F., B.S., *Purdue University, 1949.*

Civil Engineering

- Leland Dean Anderson, B.S., *California State Polytechnic College, 1954.*
James Melvin Bell, B.S., *Colorado Agricultural and Mechanical College, 1954.*
Joseph Dutcher Bennett, B.S., *University of Colorado, 1954.*
J. M. Roger De Wiest, C.E., *University of Ghent, 1949.*
Harry Augustus Griffith, Capt., U.S.A., B.S., *United States Military Academy, 1949.*
Hashim Hussain Hamzawi, C.E., *College of Engineering, Bagdad, 1951.*
McGlachlin Hatch, Lt. Col., U.S.A., B.S., *United States Military Academy, 1943.*
William Edward Huber, Capt., U.S.A., B.S., *United States Military Academy, 1949.*
Dennis Vernon Long, B.S., *California Institute of Technology, 1949.*
Roland Seba Miller, B.S., *California Institute of Technology, 1954.*
William Thornton Moore, Capt., U.S.A., B.S., *United States Military Academy, 1949.*
Manuel Morden, B.S., *California Institute of Technology, 1954.*
William Addison Rank, Capt., U.S.A., B.S., *United States Military Academy, 1949.*
Manley Eaton Rogers, Capt., U.S.A., B.S., *United States Military Academy, 1950.*
Howard Lynn Strohecker, Capt., U.S.A., B.S., *United States Military Academy, 1949.*

Electrical Engineering

- Gary Delane Boyd, B.S., *California Institute of Technology, 1954.*
Alain Brethes, *Eng., École Nationale Supérieure des Télécommunications, 1954.*
Vincenzo Maria Cestari, B.S., *California Institute of Technology, 1955.*
James Colbath Crosby, B.S., *California Institute of Technology, 1954.*

MASTER OF SCIENCE IN ENGINEERING

Electrical Engineering—continued

- Walter Frank Eichwald, B.S., *University of Pennsylvania*, 1954.
Roger Morse Golden, B.S., *California Institute of Technology*, 1954.
Nelson Newcomb Hoffman, B.S., *Drexel Institute of Technology*, 1954.
Hsung-Cheng Hsieh, B.A., *Dartmouth College*, 1954.
Curtis Carl Johnson, B.S., *California Institute of Technology*, 1954.
Walter Adolph Johnson, B.E.E., *The Cooper Union*, 1954.
Macrobio Lim, B.S., *University of the Philippines*, 1950.
Richard Philip Mathison, B.S., *Purdue University*, 1952.
Arthur Edward Miller, Jr., B.S., *California Institute of Technology*, 1954.
William Robert Moreland, B.S., *Illinois Institute of Technology*, 1954.
Richard Francis Okada, B.S., *Drexel Institute of Technology*, 1954.
Robert Keith Peterson, B.S., *University of Colorado*, 1951.
Philip Davis Potter, B.S., *California Institute of Technology*, 1954.
Willard Van Tuyl Rusch, B.S.E., *Princeton University*, 1954.
Takeshi Sato, B.S., *California Institute of Technology*, 1954.
Jerry Leon Stuart, B.S., *University of Tulsa*, 1953.
Alvin William Trivelpiece, B.S., *California State Polytechnic College*, 1953.
Theodoor Van Der Waeteren, E.M.Eng., *University of Louvain (Belgium)*, 1954.

Mechanical Engineering

- Gunnar Erik Broman, Cert., *Royal Institute of Technology (Sweden)*, 1949.
Daniel Joseph Collins, B.A., *Lehigh University*, 1954.
Allen Eugene Fuhs, B.S., *University of New Mexico*, 1951.
Robert Oren Gose, B.S., *University of Wyoming*, 1947.
Richard Eldon Hyde, B.S., *California Institute of Technology*, 1954.
John Thomas Lloyd, B.S., *California Institute of Technology*, 1954.
Regis Earl Neuman, B.S., *Carnegie Institute of Technology*, 1951.
John Stanley Niewieroski, B.S., *University of Connecticut*, 1954.
Jerry Alan Orr, B.S., *University of Miami*, 1954.
Robert Vidal Ragsac, B.S., *San Jose State College*, 1954.
Herbert Schwartz, B.M.E., *New York University*, 1949.
Robert Louis Smith, B.S., *California Institute of Technology*, 1954.
Stephen Louis Stamm, B.S., *University of Pennsylvania*, 1954.
Salvatore Philip Sutera, B.E., *Johns Hopkins University*, 1954.
Simon Tamny, B.S., *California Institute of Technology*, 1954.

ENGINEER'S DEGREE

Aeronautical Engineer

- Lawrence Cloyd Baldwin, Lt., U.S.N., B.S., *United States Naval Academy, 1945; B.S., United States Naval Postgraduate School, 1954.*
- William Curtis Benton, Major, U.S.M.C., B.S., *United States Naval Postgraduate School, 1954.*
- Carl Birdwell, Jr., Lt., U.S.N., B.S., *United States Naval Postgraduate School, 1954.*
- Roy Stribling Cornwell, Lt. Comdr., U.S.N., B.Ae.Eng., *North Carolina State College, 1943; B.S., United States Naval Postgraduate School, 1954.*
- Thomas Huston Crowe, Lt. U.S.N., B.S., *University of South Carolina, 1945; B.S., United States Naval Postgraduate School, 1954.*
- Robert Franklin Doss, Lt., U.S.N., B.S., *United States Naval Postgraduate School, 1954.*
- Alvin Lyone Fehrman, Capt., U.S.A.F., B.E., *Vanderbilt University, 1947.*
- Weston Morgan Howard, B.S., *University of Washington, 1953.*
- George Thomas James, Jr., Capt., U.S.A.F., B.S.M.E., *Purdue University, 1949.*
- Donald Walter Kiley, Lt., U.S.N., B.S., *United States Naval Postgraduate School, 1954.*
- Harold Cecil Larsen, B.S., *University of Utah, 1941; M.S., California Institute of Technology, 1946.*
- Robert McClellan, B.S., *California Institute of Technology, 1948; M.S., 1949.*
- James Foster Rex, Lt., U.S.N., B.S., *United States Naval Postgraduate School, 1954.*
- Pehr Harald Benedictus Schalin, B.S., *Finland Institute of Technology, 1946; M.S., California Institute of Technology, 1954.*
- Oscar Seidman, B.Sc., *Rutgers University, 1929; M.Sc., 1931.*
- George Stalk, Capt., U.S.A.F., B.S., *Purdue University, 1949.*
- William Jeffris Williamson, B.S., *California Institute of Technology, 1948; M.S., 1949.*

Mechanical Engineer

- Ray Deverle Bowerman, B.S., *California Institute of Technology, 1951; M.S., 1952.*
- Richard Wilson Flygare, B.S., *University of Utah, 1949; M.S., California Institute of Technology, 1953.*

DOCTOR OF PHILOSOPHY

- Douglas Einar Applequist (Chemistry and Biology). B.S., *University of California*, 1952. *Thesis: Methylene cyclobutene and Related Substances.*
- George Myron Arcand (Chemistry and Physics). B.S., *California Institute of Technology*, 1950. *Thesis: I. Studies of the Distribution of Inorganic Substances between Aqueous and Non-aqueous Phases. II. Studies in Coulometric Analysis.*
- Michel Bader (Physics and Mathematics). B.S., *California Institute of Technology*, 1952. *Thesis: The Stopping Cross Section of Various Substances for Low Energy Protons.*
- Sune Bertil Berndt (Aeronautics and Mathematics). C.E., *Swedish Royal Institute of Technology*, 1947; *Tecn. Licent.*, 1951. *Thesis: On the Influence of Wall Boundary Layers in Closed Transonic Test Sections.*
- Richard Allan Bernhard (Chemistry and Plant Physiology). B.S., *Stanford University*, 1950. *Thesis: Studies on the Mode and Mechanism of Action of alpha-Chymotrypsin.*
- Dwight Winton Berreman (Physics and Mathematics). B.S., *University of Oregon*, 1950; M.S., *California Institute of Technology*, 1952. *Thesis: A Method of Monochromatization and Precise Point Focusing of X-rays, and Its Application in Low Angle Diffraction Studies.*
- Egil Kristoffer Björnerud (Physics and Astronomy). B.S., *University of Washington*, 1949. *Thesis: I. Photometric Determination of Ionization of Cloud Chamber Tracks. II. Cloud Chamber Study of Charged V-particles.*
- John Doyle Britton (Chemistry and Mathematics). B.S., *University of California, Los Angeles*, 1951. *Thesis: Shock Waves in Chemical Kinetics.*
- John Warren Brookbank (Embryology and Animal Physiology). B.A., *University of Washington*, 1949; M.S., 1952. *Thesis: The Effect of Specific Antisera on the Cleavage of the Sea Urchin Egg.*
- Odus Roy Burggraf (Aeronautics and Physics). B.Ae., *Ohio State University*, 1952; M.S., 1952. *Thesis: A Theory of Stall Propagation in Axial Compressors on the Basis of Airfoil Characteristics.*
- C. Wayne Burnham (Geochemistry and Petrology). B.A., *Pomona College*, 1951; M.S., *California Institute of Technology*, 1953. *Thesis: Metallogenic Provinces of the Southwestern United States and Northern Mexico.*
- Douglas Dean Campbell (Metalliferous Geology and Mineralogy). B.A.Sc., *University of British Columbia*, 1946. *Thesis: Geology of the Pitchblende Deposits of Port Radium, Great Bear Lake, N.W.T.*
- John Arthur Carlson (Mechanical Engineering and Physics). B.S., *Illinois Institute of Technology*, 1951; M.S., *California Institute of Technology*, 1952. *Thesis: Analytical and Experimental Studies of Vehicle Dynamics Behavior.*
- Robert Apperson Chase (Aeronautics and Mathematics). B.S., *Stanford University*, 1950; M.S., 1951. *Thesis: Pressurized Fuselage Stress Analysis.*
- Robert Norman Clayton (Chemistry and Mathematics). B.Sc., *Queen's University*, 1951; M.Sc., 1952. *Thesis: Variations of Oxygen Isotope Abundances in Rock Minerals.*
- Duane Herbert Cooper (Physics and Mathematics). B.S., *California Institute of Technology*, 1950. *Thesis: Pair Spectrometer Measurements in 500 Mev Bremsstrahlung.*
- Eugene Floyd Cox (Chemistry and Plant Physiology). B.S., *Georgia Institute of Technology*, 1950; M.S., 1951. *Thesis: Carbonium Ion Rearrangements in Reactions of Cyclopropylcarbiny and Cyclobutyl Derivatives.*

DOCTOR OF PHILOSOPHY

- Stephen Franklin Crumb (Electrical Engineering and Physics). B.S., *University of Texas*, 1943; M.S., 1948. Thesis: *A Study of the Effects of Damping on Normal Modes of Electrical and Mechanical Systems*.
- Milford Hall Davis (Physics and Mathematics). B.S., *Yale University*, 1949; M.S., *California Institute of Technology*, 1950. Thesis: *An Atomic Beam Method for Measuring Absolute f -Values*.
- Joseph Myers Denney (Engineering Science and Physics). B.S., *California Institute of Technology*, 1951; M.S., 1952. Thesis: *A Study of Electron Effects in Solid Solution Alloys of Titanium*.
- Saul Feldman (Mechanical Engineering and Mathematics). B.S., *University of California, Los Angeles*, 1951; M.S., 1953. Thesis: *On the Hydrodynamic Stability of Two Viscous Incompressible Fluids in Parallel Uniform Shearing Motion*.
- Gary Felsenfeld (Chemistry and Biology). A.B., *Harvard College*, 1951. Thesis: *Some Modifications and Applications of the Pauling Theory of Ferromagnetism*.
- Arthur W. Fort (Chemistry and Literature). B.S., *University of Chicago*, 1949; S.M., 1951. Thesis: *The Reactions of 3-Arylpropylamines with Nitrous Acid*.
- Edwin Jean Furshpan (Animal Physiology and Embryology). B.A., *University of Connecticut*, 1950. Thesis: *On Certain Sensory and Motor Systems of Decapod Crustaceans*.
- George Jay Gleghorn, Jr. (Electrical Engineering and Mathematics). B.S., *University of Colorado*, 1947; M.S., *California Institute of Technology*, 1948. Thesis: *An Analog Computer for the Solution of Eigenvalue Problems*.
- Martin Goldsmith (Mechanical Engineering and Physics). B.S., *University of California*, 1951; M.S., *California Institute of Technology*, 1952. Thesis: *The Burning of Single Drops of Fuel in Oxidizing Atmospheres*.
- Juris Hartmanis (Mathematics and Physics). B.A., *University of Marburg*, 1949; M.A., *University of Kansas City*, 1951. Thesis: *Some Embedding Theorems for Lattices*.
- Ray Alden Hefferlin (Physics and Astronomy). B.A., *Pacific Union College*, 1951. Thesis: *A Photoelectric Study of Line Intensities in the Iron Arc Spectrum*.
- Albert Roach Hibbs (Physics and Mathematics). B.S., *California Institute of Technology*, 1945; S.M., *University of Chicago*, 1947. Thesis: *The Growth of Water Waves Due to the Action of the Wind*.
- Robert Ross Jennings (Chemistry and Biology). B.S., *California Institute of Technology*, 1950. Thesis: *I. Kinetic Studies with Alpha-chymotrypsin. II. Genetic Studies in Neurospora*.
- John Beverley Johnston (Mathematics and Physics). B.S., *California Institute of Technology*, 1951. Thesis: *Universal Infinite Partial Orders*.
- Armin Dale Kaiser (Biophysics and Chemistry). B.S., *Purdue University*, 1950. Thesis: *A Genetic Analysis of Bacteriophage Lambda*.
- Stanley Leonard Kameny (Physics and Mathematics). B.S., *Queens College, Flushing, New York*, 1948; M.S., *California Institute of Technology*, 1949. Thesis: *The alpha-Particle Model of α^0* .
- William James Karzas (Physics and Mathematics). B.S., *California Institute of Technology*, 1949. Thesis: *Gamma Rays and Nuclear Reactions Induced by Charged Particles*.

DOCTOR OF PHILOSOPHY

- Shankar Lal (Aeronautics and Mathematics). B.Sc., Benares Hindu University, 1944; D.I.I.Sc., Indian Institute of Science (Bangalore), 1946; D.I.C., Imperial College of Science and Technology (London), 1947; M.S., London University, 1949. Thesis: *Heat Transfer in Compressible Laminar Boundary Layers.*
- John Irvin Lauritzen, Jr. (Physics and Mathematics). B.A., Miami University, 1949. Thesis: *An Experimental Determination of the Specific Charge of the Electron.*
- David Arthur Liberman (Physics and Mathematics). B.S., California Institute of Technology, 1949. Thesis: *The Interactions of Protons with Li⁺.*
- Cinna Lomnitz (Geophysics and Civil Engineering). C.E., University of Chile, 1948; M.S., Harvard University, 1950. Thesis: *Creep Measurements in Igneous Rocks with Some Application to Aftershock Theory.*
- Ralph Lutwack (Chemistry and Physics). B.S., California Institute of Technology, 1950. Thesis: *Studies on the Mode of Enzyme Catalysis and the Hydrolysis of Bis-P-Dimethylaminobenzalazine.*
- Richard Jeffrey Magnus (Aeronautics and Mathematics). B.Ae., University of Minnesota, 1944; M.S., 1947; Ae.E., California Institute of Technology, 1948. Thesis: *An Experimental Investigation of the Transfer of Heat from a Small Wire to a Viscous Compressible Fluid.*
- Joseph David Mandell (Virology and Genetics). B.S., Rutgers University, 1950; M.S., Oklahoma Agricultural and Mechanical College, 1951. Thesis: *Inactivation of Bacteriophage T₄ by Specific Antiserum.*
- David Treadway Manning (Chemistry and Biology). B.S., California Institute of Technology, 1950. Thesis: *I. Some Studies in Enzyme Kinetics. II. The Oxidation of 3-indoleacetic Acid by Plant Enzymes. III. The Synthesis of Some alpha-alkyl alpha-amino Acids and Their Derivatives.*
- Koichi Mano (Physics and Mathematics). B.S., Tokyo University, 1945. Thesis: *The Self-Energy of the Scalar Nucleon.*
- Craig Marks (Mechanical Engineering and Chemistry). B.S., California Institute of Technology, 1950; M.S., 1951. Thesis: *The Effects of Chamber Geometry, Surface Characteristics, and Temperature Boundary Conditions on the Hydrogen-Oxygen Reaction.*
- Royal Richard Marshall (Chemistry and Geology). B.S., University of Minnesota, 1950. Thesis: *I. The Rate of Recombination of Iodine Atoms. II. Some Studies of the Trace Quantities of Lead, Uranium, and Thorium in Marine Carbonate Skeletons.*
- John William McKee (Physics and Biology). B.S., Iowa State College, 1949. Thesis: *Indole Inhibition of Cofactor Activated Bacteriophage.*
- William Raymond Mills, Jr. (Physics and Mathematics). B.A., The Rice Institute, 1951. Thesis: *Absolute Measurement of Internal Conversion Coefficients.*
- David Charles Oakley (Physics and Mathematics). B.S., California Institute of Technology, 1950; M.S., 1952. Thesis: *The Photoproduction of Neutral Pions from Hydrogen.*
- Allen Ives Ormsbee (Aeronautics and Mathematics). B.S., University of Illinois, 1946; M.S., 1949. Thesis: *Conical Techniques for Incompressible Non-viscous Flow.*
- Donald Ralph Petersen (Chemistry and Physics). B.A., Lawrence College, 1951. Thesis: *The Crystal Structure of Feist's Acid.*

DOCTOR OF PHILOSOPHY

- Cornelius John Pings, Jr. (Chemical Engineering, Chemistry and Mathematics). B.S., *California Institute of Technology*, 1951; M.S., 1952. Thesis: I. *An Orthogonal Polynomial Equation of State*. II. *Application of the Benedict Equation of State to the Methane-n-Pentane System*. III. *Isobaric Heat Capacity at Bubble Point of n-Decane*.
- Rodrigo Alvaro Restrepo (Mathematics and Physics). B.A., *Lehigh University*, 1951. Thesis: *Optimal Decisions with Applications to Tactical Problems*.
- Bruce Joseph Rogers (Plant Physiology and Bio-organic Chemistry). B.S.F., *University of California*, 1949; M.S.F., 1950. Thesis: *Studies on the Amino Acid Metabolism of Higher Plants*.
- John James William Rogers (Petrology and Geochemistry). B.S., *California Institute of Technology*, 1952; M.S., *University of Minnesota*, 1952. Thesis: *Textural Studies in Igneous Rocks near Twenty-Nine Palms, California*.
- Roy Monroe Sachs (Biology and Invertebrate Paleontology). B.S., *Massachusetts Institute of Technology*, 1951. Thesis: *Floral Initiation in *Cestrum nocturnum* (the "Night-blooming Jasmine")*.
- Frank Boyer Salisbury (Plant Physiology and Geochemistry). B.S., *University of Utah*, 1951; M.S., 1952. Thesis: *Kinetic Studies on the Physiology of Flowering*.
- Kazuhiko Sato (Chemical Engineering and Chemistry). B.S., *California Institute of Technology*, 1951; M.S., 1952. Thesis: I. *Effect of Shape on Evaporation of Drops of n-Heptane*. II. *Thermal and Material Transport from Spheres into a Turbulently Flowing Air Stream*. III. *Temperature Gradients and Recovery Factors in Steady, Uniform Flow*.
- Alfred Dale Scarbrough (Electrical Engineering and Physics). B.S., *California Institute of Technology*, 1945; M.S., 1947. Thesis: *The Use of Junction Transistors in Switching Circuits*.
- Dorothy Ann Semenow (Chemistry and Biology). B.A., *Mount Holyoke College*, 1951. Thesis: *The Mechanism of Animations of Halobenzenes*. II. *Quantum Mechanical Calculations of Electrical Effects of Substituents in Para-substituted Anilines*.
- Sedat Serdengeçti (Mechanical Engineering and Mathematics). B.S., *Syracuse University*, 1951; M.S., *California Institute of Technology*, 1952. Thesis: *Analysis of Optimizing Control Systems with Special Reference to Noise Interference Effects*.
- Leon Theodore Silver (Structural Geology and Petrology and Geochemistry). B.S., *University of Colorado*, 1945; M.S., *University of New Mexico*, 1948. Thesis: *The Structure and Petrology of the Johnny Lyon Hills Area, Cochise County, Arizona*.
- George Tolmie Skinner (Aeronautics and Physics). B.S., *University of St. Andrews*, 1948; M.S., *California Institute of Technology*, 1949; Ae.E., 1951. Thesis: *A Time Correlator for Problems in Aerodynamics*.
- William Glenn Sly (Chemistry and Physics). B.S., *San Diego State College*, 1951. Thesis: I. *The Crystal Structure of Oxamine*. II. *The Crystal Structure of 15,15'-Dehydro-beta-Carotene*.
- Gerald Speisman (Physics and Mathematics). B.S., *City College of New York*, 1951. Thesis: *The Neutron-Proton Mass Difference*.
- Edward Abraham Stern (Physics and Mathematics). B.S., *California Institute of Technology*, 1951. Thesis: *Charge Spectrum of Heavy Primary Cosmic Rays*.

DOCTOR OF PHILOSOPHY

- John Charles Stewart (Astronomy and Physics). B.S., *University of the South*, 1951; Sc.M., *Brown University*, 1952. Thesis: *A Quantitative Analysis of the Atmospheres of Three Peculiar Low-Luminosity B Stars*.
- Arnold Adolph Strassenburg (Physics and Mathematics). B.S., *Illinois Institute of Technology*, 1951; M.S., *California Institute of Technology*, 1953. Thesis: *The Lifetimes of the Neutral Lambda and Theta Particles*.
- George Walter Sutton (Mechanical Engineering and Physics). B.M.E., *Cornell University*, 1952; M.S., *California Institute of Technology*, 1953. Thesis: *Dynamic Photoelasticity Applied to the Study of Stress Waves*.
- George Henry Trilling (Physics and Mathematics). B.S., *California Institute of Technology*, 1951. Thesis: *A Cloud-Chamber Investigation of Charged V Particles*.
- David Richard Viglierchio (Bio-organic Chemistry and Plant Physiology). B.S., *California Institute of Technology*, 1950. Thesis: *Investigations of Some Plant Wound Hormones*.
- Theodore Stratton Webb, Jr. (Physics and Mathematics). B.S., *University of Oklahoma*, 1951. Thesis: *The Elastic Scattering of Protons by F^{19} and N^{14}* .
- Truman Owen Woodruff (Physics and Mathematics). A.B., *Harvard College*, 1947; B.A., *Oxford University*, 1950. Thesis: *On the Orthogonalized Plane Wave Method for Calculating Energy Eigenvalues in a Periodic Potential*.
- William Vale Wright, Jr. (Mechanical Engineering and Physics). B.S., *California Institute of Technology*, 1951. Thesis: *Precipitation Embrittlement Studies in Vacuum Melted Iron-Chromium Alloys*.
- Hsun-Tiao Yang (Aeronautics and Mathematics). B.S., *National Central University*, 1946; M.S., *University of Washington*, 1950. Thesis: *Rayleigh's Problem at Low Mach Number According to the Kinetic Theory of Gases*.
- Stanley Alan Zwick (Physics and Mathematics). B.S., *California Institute of Technology*, 1950. Thesis: *The Growth and Collapse of Cavitation Bubbles*.

CANDIDATES FOR COMMISSIONS
UNITED STATES AIR FORCE
RESERVE OFFICERS TRAINING CORPS

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Gilbert L. Beebower	Hugh G. Leney
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Prizes and Awards

CONGER PEACE PRIZE ORATION

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

First prize, DONALD F. MEYER

Second prize, ROBERT K. TUCKER

MARY A. EARLE MCKINNEY PRIZE IN ENGLISH

*Established in 1946 by the late Samuel P. McKinney, M.D.,
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First prize, ALAN POISNER

Second prize, JAY GLASEL

Third prize, PETER GOTTLIEB

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)

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.

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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 1955 by the Division of Chemistry and Chemical Engineering.

DOUGLAS APPLEQUIST