

California Institute of Technology



Fifty-eighth Annual

COMMENCEMENT

EXERCISES

Friday afternoon

June sixth, nineteen fifty-two

at four-thirty o'clock

Academic Procession

Chief Marshall: HARVEY EAGLESON, Ph.D.

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

DONALD S. CLARK, 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

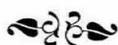
THE TRUSTEES OF THE CALIFORNIA INSTITUTE

THE COMMENCEMENT CHAPLAIN,
THE COMMENCEMENT SPEAKER,
THE CHAIRMAN OF THE BOARD OF TRUSTEES,
AND THE PRESIDENT OF THE
CALIFORNIA INSTITUTE

PROGRAM

Presiding: JAMES R. PAGE, LL.D.

Chairman of the Board of Trustees



ORGAN PRELUDE AND PROCESSIONAL

INVOCATION

THE REVEREND GANSE LITTLE, D. D.

Pastor of the Pasadena Presbyterian Church

COMMENCEMENT ADDRESS

“Retrospect and Prospect”

JOHN E. POMFRET, Ph. D., LL. D.

Director of the Henry E. Huntington Library and Art Gallery

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
FRANKLIN THOMAS, C. E., D. Eng.,
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
WILLIAM W. MICHAEL, B. S.,
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

CHARGE TO THE GRADUATING CLASS AND ANNOUNCEMENTS

PRESIDENT DuBRIDGE

BENEDICTION

THE REVEREND DOCTOR LITTLE
*(The audience is requested to remain seated after the Benediction
until the end of the Recessional march)*

RECESSIONAL MARCH

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

Candidates for Degrees

BACHELOR OF SCIENCE IN SCIENCE

Douglas Creighton Alverson	David Swarner Koons
Michel Bader	Francis Ronald Kramer
Rodger Willard Baier	Dale Curtiss Krause
Robert G. Blair	Robert Allan Laff
Eliot Andrew Butler*	Donald L. Lamar
Sherman Eugene Butler	Robert Edward Lawrence
Michael John Callaghan†	Moisés Levy
Samuel P. Cook	Clinton Lew
Robert Stephen Davis	John Macalpine McCool
Alexander Jack Dessler	Charles Robert Miller
Richard Raymond Dickinson	Philip Moore Orville*†
William Frederick Edmondson	Basil R. Parnes†
Bernard Andrew Engholm†	Peter Jeffress Pauling
Ernst Gehrels	John Chester Porter, Jr.
Malbone W. Greene	Stanley R. Rawn, Jr.
Montague Durar Griffin	Henry Leopold Richter, Jr.
Thomas Warren Hamilton	John James William Rogers*
Sigmund Hammer	Ronald Lee Shreve†
Bruno Herscovici*	Jack I. Simmons
John Lincoln Howell	Deane Kingsley Smith, Jr.
Marvin Harold Hyman	Donald Edward Stewart
Alan Robert Johnston*	Donald Emory Sutton
Walter Barclay Kamb*	Peter Howard Verdier*
Melvin Louis Katz, Jr.	Richard P. Von Herzen
Roy A. Keir	William Taylor Webber
William Anthony Kemmel*	Richard W. Weeks
Gilbert Edward Kitching†	Jesse Leo Weil*†

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

†*Awarded the Honor Key by the Associated Students, CIT, for participation in student activities.*

BACHELOR OF SCIENCE IN ENGINEERING

Paul Milton Aagaard*	James Kemble La Fleur
Robert B. Altermatt	Frank C. Lang, Jr.
Donald Eugene Arnold	Carl Victor Larson
Wilbur James Barmore	David Arthur Lee
John Douglas Baugher	John Patrick McCourt
John Anthony Boppart, Jr.*†	Archie John McEwing
Richard Lee Bridges*	Robert Frederick Meyer
Allan Clark Burton	Samuel Forsberg Middlebrook
Daniel Ellis Carney	Randolph Gaylon Moore
Mell Duncan Cassidy	J. Crawford Noll*
Russel Kyle Catterlin	Robert Earl Oliver
Henry Alexander Clutz	Norman Delane Peck
George Emmett Cook	Robert Charles Perpall
Armand Butts Crump	Ralph E. Perrault*
Leland Jerome Cuff	Robert Matthews Phillips
Edward Farnum Davis	Reno U. Pierotti
Forrest William Davis	William Clarence Pilkington, Jr.
Malcolm G. Davis*	Howard Glenn Preston
Raymond Fernand Destabelle	Charles Leo Primbs
Leon Fred Edelson	Denton Deshler Riggs*
Richard H. Fuller*	William Joseph Rihn
Hodge C. Gaines	James A. Ross, Jr.
Victor Gates	Thomas L. Russell*
Waheed Khan Ghauri	Martin L. Sandell
Robert Henry Graff	Edwin Peter Schlinger, Jr.†
Norman Eugene Gray*	Albert Russell Snider*†
Stanley Gronert†	Augusto Luis Soux
David Leslie Hanna†	Robert Edward Stanaway†
Raymond LeRoy Heacock	Donald Kenneth Tautz†
James Gay Helmuth*	Richard Ripley Tracy
William Wolcott Irwin	Dudley Wright Wagner
Boyd Parker Israelsen*	Ernesto Juan Weber
Harold L. Jackson	Keith Llewellyn Winsor*
Richard Y. Karasawa†	William LaVay Wise
Richard E. Kennon	Edgar Yuen Wong
Henry Fidel Keswick	Harold James Woody

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

†Awarded the Honor Key by the Associated Students, CIT, for participation in student activities.

MASTER OF SCIENCE IN SCIENCE

Astronomy

George Ogden Abell, B.S., *California Institute of Technology*, 1951.

Chemistry

Thomas Edwin Ferington, B.A., *University of Buffalo*, 1949.

Willis Andrew Rosser, Jr., B.S., *California Institute of Technology*, 1950.

Chemical Engineering

Paul Francis Helfrey, B.S., *California Institute of Technology*, 1951.

Hiroshi Kamei, B.S., *California Institute of Technology*, 1951.

Cornelius John Pings, Jr., B.S., *California Institute of Technology*, 1951.

George Neal Richter, B.E., *Yale University*, 1951.

Sergio E. Rodriguez Gelpi, B.S., *California Institute of Technology*, 1951.

Kazuhiko Sato, B.S., *California Institute of Technology*, 1951.

Geological Sciences

Fred Barker, B.S., *Massachusetts Institute of Technology*, 1950.

Barrie Hill Bieler, B.S., *California Institute of Technology*, 1951.

Bernard Joseph O'Neill, Jr., B.S., *Franklin and Marshall College*, 1950.

Geophysics

Richard S. Sharp, B.S., *California Institute of Technology*, 1951.

Mathematics

Melvin Alfred Pedersen, B.A., *Reed College*, 1950.

Meteorology

John Robert Abbott, B.S., *Iowa State College*, 1948.

John Ernest Anderson, B.S., *New Mexico College of Agriculture and Mechanic Arts; M.S.Ch.E., Iowa State College*, 1950.

Donald James Beck, B.Ae.E., *University of Detroit*, 1949.

Charles Parker Benner, B.S., *Texas College of Arts and Industry*, 1940.

Charles Frank Bissett, B.B.A., *University of Texas*, 1947.

Smith Vinson Bucy, B.A., *Abilene Christian College*, 1941.

Sullivan Graham Campbell, B.A., *University of Kansas City*, 1947.

Ralph Stephen Carrigan, B.S., *Louisiana State University*, 1948; B.L., *Harvard University*, 1951.

Wesley Caspers, B.S., *Superior State Teachers College*, 1940; M.A., *University of Minnesota*, 1950.

Ernest Richard Cram, B.A., *University of Kansas*, 1949.

Louis Max Culp, B.A., *University of Kansas*, 1949.

Markham Allen Dickson, B.S., *Massachusetts Institute of Technology*, 1947.

(MASTER OF SCIENCE IN SCIENCE—*Meteorology*, cont.)

- James Richard Garrett, *M.A.*, *Duke University*, 1947; *Ph.D.*, 1950.
Etalo Giacomo Gnutti, *B.S.*, *University of Connecticut*, 1941; *LL.B.*, *University of Virginia*, 1948.
Ralph David Halbower, Jr., *B.S.*, *Agricultural and Mechanical College of Texas*, 1948.
Marvin Eugene Harrison, *B.S.*, *Texas Technological College*, 1948.
Howard Earl Johnson, *B.A.*, *University of Denver*, 1947; *B.S.*, 1948.
Richard Leroy Kinney, *B.A.*, *University of Wichita*, 1947.
Joseph Francis Loftus, *B.A.*, *Scranton University*, 1938; *LL.B.*, *Georgetown University School of Law*, 1950.
Dean Raymond Love, *B.A.*, *Pomona College*, 1942; *M.B.A.*, *Stanford University*, 1948.
Adrian Carl Lunday, *B.A.*, *Baylor University*, 1950.
George Washington Mayle, *B.A.*, *University of California*, 1947.
Jeter Alexander Pruett, *B.S.*, *Arkansas State College*, 1941.
Rayburn Graham Pyle, Jr., *A.B.*, *Louisiana State Normal College*, 1937.
Peter Quon, *B.A.*, *University of California*, 1948; *M.D.*, 1951.
Evan Elijah Roberts, Jr., *B.S.*, *Texas Technological College*, 1948.
Robert Alexander Sanders, *B.S.*, *Cumberland University*, 1937.
James Doyne Sartor, *A.B.*, *University of California*, 1947.
Thomas Lee Shelly, *B.S.*, *University of California*, 1949.
John Leon Sorenson, *B.S.*, *Brigham Young University*, 1951.
Parke Purdy Starke, Jr., *B.S.*, *University of Richmond*, 1940.
William Harold Staten, *B.S.*, *University of Maryland*, 1952.
Gilbert Eugene Stegall, *B.S.*, *East Texas State Teachers College*, 1940.
George Robert Stuart, *A.B.*, *University of California*, 1948; *M.S.*, *University of Southern California*, 1949.
John Curtis Thompson, *B.S.*, *Oklahoma Agricultural and Mechanical College*, 1948.
Clement Jameson Todd, *A.B.*, *University of California*, 1950.
William Lowry Wallace, *B.S.*, *Texas Technological College*, 1949.
Bruce Johnson Whitaker, *B.A.*, *Santa Barbara State College*, 1947; *M.S.*, *University of Southern California*, 1949.
Howard Ellsworth Wilson, *B.S.*, *University of California*, 1947.
Winston Harold Wingerd, *B.S.*, *Kansas State College of Agriculture and Applied Science*, 1949; *M.S.*, 1949.
William T. Wolf, *B.S.*, *Washington University*, 1948.
Joseph Francis Woods, *B.A.*, *Canisius College*, 1935.
William Henry Wyatt, *A.B.*, *Kansas State College*, 1940; *M.A.*, 1941.
Richard Bane Zacha, *B.S.*, *Columbia University*, 1949; *M.A.*, *Catholic University of America*, 1951.

Physics

- Leo L. Baggerly, *B.S.*, *California Institute of Technology*, 1951.
Dwight Winton Berreman, *B.S.*, *University of Oregon*, 1951.
George Herbert Blount, *A.B.*, *University of California*, 1950.
Edward Charles DuFort, *B.S.*, *California Institute of Technology*, 1949.
Arnold Willard Guess, *B.S.*, *Cornell University*, 1951.

John Colville Helmer, B.S., *Lawrence College, 1950.*
Leslie Richmond Heselton, Jr., B.S., *United States Naval Academy, 1942.*
Peter Michael Kelly, B.S., *Union College, 1950.*
Henry Glass Munson, B.S., *United States Naval Academy, 1932.*
David Charles Oakley, B.S., *California Institute of Technology, 1950.*
William Rodman Smythe, B.S., *California Institute of Technology, 1951.*

MASTER OF SCIENCE IN ENGINEERING

Aeronautics

Wayne Metcalf Beebe, B.S., *California Institute of Technology, 1951.*
David Dean Beyer, B.Sc., *Parks College, 1951.*
Robert Eugene Covey, B.Sc., *California Institute of Technology, 1951.*
Robert Park Dawson, B.S., *Louisiana State University, 1951.*
Robert Tenney DeVault, B.S., *California Institute of Technology, 1942.*
Joe Griffin Eisley, B.Sc., *Parks College, 1951.*
Ruben Manalang Gloria, B.S.Ae.E., *University of Maryland, 1951.*
Denver Calvin Gore, Jr., B.Sc., *University of Washington, 1946.*
Elias Antero Järvineva, B.Sc., *Finland Institute of Technology, 1949.*
James Madison Kendall, Jr., B.S., *Carnegie Institute of Technology, 1951.*
Krishnamurty Karamcheti, B.S., *Benares Hindu University, 1946; D.I.I.Sc., Indian Institute of Science, 1947.*
Toshi Kubota, B. of E., *Tokyo University, 1947.*
Maxwell Mason, B.S., *University of Chicago, 1930; B.F.A., Yale University, 1934.*
Albert Gallatin Munson, Jr., B.Sc., *Louisiana State University, 1951.*
Arthur Richter, B.S., *Purdue University, 1951.*
William Clay Robison, B.S., *United States Military Academy, 1949.*
Winston Walker Royce, B.S., *California Institute of Technology, 1951.*
Roger Donald Schaufele, B.A.E., *Rensselaer Polytechnic Institute, 1949.*
Yung-chung Shen, B.S., *National Central University, 1942.*
Herman Carl Thorman, B.S., *Purdue University, 1946.*
Chester Winfred Weger, B.Sc.Ae., *University of Michigan, 1942.*

Civil Engineering

Alan Gordon Fletcher, B.S., *University of British Columbia, 1948.*
Earl Charles Hefner, B.S., *California Institute of Technology, 1951.*
Richard Miles Libbey, B.S., *California Institute of Technology, 1951.*
Ronald Theodore McLaughlin, B.S., *Queen's University, 1951.*
Robert Ross Munro, B.S., *California Institute of Technology, 1951.*
Nikhilesh Roy, B.S., *Bengal Engineering College, 1949.*
Henry Eiichi Suzuki, B.S., *University of Illinois, 1949.*
Richard Stanley Winkler, B.S., *University of Colorado, 1951.*

(MASTER OF SCIENCE IN ENGINEERING—cont.)

Electrical Engineering

- Michael Abram Basin, B.S., *California Institute of Technology, 1951.*
Rodney Sturgis Bunker, B.S., *California Institute of Technology, 1951.*
George Cokas, B.S., *University of Southern California, 1949.*
Thomas Weir Connolly, B.S., *California Institute of Technology, 1951.*
Roland Paul Joseph Dufour, B.S., *Lycée de Rennes, 1941; Licence-ès-Science, University of Rennes, 1944.*
Carl Edward Fox, B.S., *California Institute of Technology, 1950.*
Steingrimur Hermannsson, B.S., *Illinois Institute of Technology, 1951.*
Albert S. Jackson, B.S., *California Institute of Technology, 1951.*
Terry Winthrop Koerner, B.S., *California Institute of Technology, 1951.*
Richard Stephen Pardee, B.S., *California Institute of Technology, 1951.*
José Picornell Martí, B.E.E., *Manhattan College, 1950.*
Jean Robieux, B.E., *École Polytechnique, 1949; École Nationale de l'Aviation Civile, Paris, 1951.*
Logan Hay Schlipf, B.S., *Northwestern University, 1951.*

Mechanical Engineering

- Elias George Arcoulis, B.S., *University of Toronto, 1951.*
Harry Alexander Begg, B.S., *California Institute of Technology, 1951.*
Ray D. Bowerman, B.S., *California Institute of Technology, 1951.*
Oswin Norman Brown, B.S., *Oregon State College, 1947.*
Frank Charles Bumb, Jr., B.S., *California Institute of Technology, 1951.*
John Arthur Carlson, B.S., *Illinois Institute of Technology, 1951.*
Joseph Myers Denney, B.S., *California Institute of Technology, 1951.*
Joseph Andrew Dove., B.S., *University of Colorado, 1943.*
David George Elliott, B.S., *California Institute of Technology, 1951.*
Martin Goldsmith, B.S., *University of California, 1951.*
Paul Hideyo Hayashi, B.S., *Massachusetts Institute of Technology, 1951.*
Michel Jaugey, B.E., *École Polytechnique, 1951.*
James Oliver Jepson, B.M.E., *New York University, 1950.*
Clark Marvin Long, B.S., *University of Idaho, 1951.*
Peter Vroman Mason, B.S., *California Institute of Technology, 1951.*
Dick Quan, B.S., *University of British Columbia, 1949.*
Robert Emmet Rodman, B.S., *University of Washington, 1949.*
Sedat Serdengeçti, B.S., *University of Syracuse, 1951.*
James Carroll Sheppard III, B.S., *Stanford University, 1951.*
Albert Eugene Van Hise, B.S., *California Institute of Technology, 1951.*
Harry Edwin Williams, B.S., *University of Santa Clara, 1951.*
Gordon Everett Zima, A.B., *Stanford University, 1942.*

ENGINEER'S DEGREES

Aeronautical Engineer

- Paul Edward Arbo, Lt., U.S.N., B.S., *United States Naval Academy, 1943; B.S.(E.E.), United States Naval Postgraduate School, 1951.*
- Jack Lincoln Becker, Lt. Comdr., U.S.N., B.S., *United States Naval Academy, 1942; B.S.(Ae.E.), United States Naval Postgraduate School, 1951.*
- Dale William Cox, Jr., Lt. Comdr., U.S.N., B.S., *United States Naval Academy, 1942; B.S.(Ae.E.), United States Naval Postgraduate School, 1951.*
- Aram Ohannes Dervishyan, M.S., *California Institute of Technology, 1951.*
- George August Eriksen, Lt., U.S.N., B.S., *United States Naval Academy, 1944; B.S.(Ae.E.), United States Naval Postgraduate School, 1951.*
- Richard Gaibler, Lt., U.S.N., B.S., *United States Naval Academy, 1943; B.S.(Ae.E.), United States Naval Postgraduate School, 1951.*
- Frederic William Hartwig, Capt., U.S.A.F., B.S., *United States Military Academy, 1945; M.S., California Institute of Technology, 1951.*
- Robert Joseph Holm, Lt. Col., U.S.M.C., B.A., *St. Olaf College, 1939; B.S.(E.E.), United States Naval Postgraduate School, 1951.*
- Ralph J. Kauffman, Lt., U.S.N., B.S., *United States Naval Academy, 1943; B.S.(Ae.E.), United States Naval Postgraduate School, 1951.*
- Gregg Mueller, Lt. Comdr., U.S.N., B.S., *United States Naval Academy, 1942; B.S.(Ae.E.), United States Naval Postgraduate School, 1951.*
- Harvey Orin Nay, B.S., *University of Colorado, 1947; M.S., California Institute of Technology, 1948.*
- Martin Samuel Robinson, B.S., *California Institute of Technology, 1950; M.S., 1951.*
- Joseph Herman Schroeder, Lt., U.S.N., B.S., *United States Naval Academy, 1944; B.S.(E.E.), United States Naval Postgraduate School, 1951.*
- Roland Churchill Thatcher, Jr., Lt., U.S.N., B.S., *Michigan State College, 1941; B.S.(Ae.E.), United States Naval Postgraduate School, 1951.*
- Richard Earl Wallace, B.S., *University of Wichita, 1949.*
- Warren E. Weinberg, Capt., U.S.M.C., B.S., *University of Idaho, 1943; B.S.(E.E.), United States Naval Postgraduate School, 1951.*
- Frank Arthur Woodward, B.S.Sc., *University of British Columbia, 1948; M.A.Sc., University of Toronto, 1949.*

Chemical Engineer

- Robert Mitchell Sherwin, B.S., *California Institute of Technology, 1943; M.S., 1950.*

Civil Engineer

- Robert Bruce Linderman, B.S., *Utah State Agricultural College, 1949; M.S., California Institute of Technology, 1950.*

Mechanical Engineer

- Henry Shapiro, B.S., *California Institute of Technology, 1950; M.S., 1951.*

DOCTOR OF PHILOSOPHY

- Helmut Arthur Abt. (Astronomy and Physics), B.S., *Northwestern University*, 1946; M.S., 1948. Thesis: *An Analysis of the Variable Star, W Virginis.*
- Allan James Acosta (Mechanical Engineering and Aeronautics), B.S., *California Institute of Technology*, 1945; M.S., 1949. Thesis: *An Experimental and Theoretical Investigation of Two-Dimensional Centrifugal Pump Impellers.*
- Berni Julian Alder. (Chemistry and Physics), B.S., *University of California*, 1947; M.S., 1948. Thesis: *I. The Radial Distribution Function and the Thermodynamic Properties of Monatomic Liquids. II. A Statistical Mechanical Theory of the Coefficient of Thermal Conductivity of Monatomic Liquids.*
- E. Leonard Arnoff. (Mathematics and Physics), B.S., *Western Reserve University*, 1943; M.S., *Case Institute of Technology*, 1948. Thesis: *Partial Differential and Difference Equations.*
- Paul David Arthur. (Aeronautics and Mathematics), B.S., *University of Maryland*, 1944; M.S., 1948. Thesis: *Effects of Impurities on the Supersaturation of Nitrogen in a Hypersonic Wind Tunnel.*
- Benjamin Bernholtz. (Mathematics and Physics), B.A., *University of Toronto*, 1948; M.A., 1949. Thesis: *Complex Function Theory for Functions with Arguments and Values in Locally Convex Linear Topological Spaces.*
- Max Bettman. (Chemistry and Physics), B.A., *Reed College*, 1948. Thesis: *The Determination of the Crystal Structure of Potassium Picrate.*
- Rolf Dietrich Buhler. (Aeronautics and Physics), B.A.E., *University of Minnesota*, 1943; M.S., *California Institute of Technology*, 1944; A.E., 1948. Thesis: *Theoretical Study on the Condensation of Nitrogen and Air in Hypersonic Wind Tunnels.*
- Norman Bulman. (Chemistry and Physics), B.A., *University of British Columbia*, 1944; M.A., 1947. Thesis: *I. Hapten Inhibition Studies with a Series of Local Anesthetics Derived from Piperidino Alcohols. II. The Incorporation of C¹⁴-Carboxyl-Labeled Leucine by Serum Proteins.*
- Tucker Carrington. (Chemistry and Physics), B.S., *University of Virginia*, 1948. Thesis: *Photoelectric Observation of the Rate of Dissociation of Dinitrogen Tetroxide Behind a Shock Wave.*
- Che-Min Cheng. (Mechanical Engineering and Mathematics), B.S., *National Tsing Hua University*, 1947; M.S., *California Institute of Technology*, 1949. Thesis: *Studies on Thermal Stresses in Elastic Solids.*
- Paolo Comba. (Mathematics and Aeronautics), A.B., *Bluffton College*, 1947. Thesis: *Geometry of Finite Dimensional Moment Spaces and Applications to Orthogonal Polynomials.*
- Warren Evald Danielson. (Physics and Mathematics), B.S., *California Institute of Technology*, 1949; M.S., 1950. Thesis: *Application of the Point Focusing X-Ray Monochromator to the Study of Low Angle Diffraction.*
- Robert Yost Dean. (Mathematics and Physics), B.A., *Willamette University*, 1942; M.S., *California Institute of Technology*, 1946. Thesis: *Laplace Transform in Commutative Banach Algebras.*
- Paul Dergarabedian. (Mechanical Engineering and Physics), B.S., *University of Wisconsin*, 1948; M.S., 1949. Thesis: *The Rate of Growth of Vapor Bubbles in Superheated Water.*
- William Joseph Dixon. (Electrical Engineering and Physics), B.S., *California Institute of Technology*, 1948; M.S., 1949. Thesis: *An Analysis of Errors in the Electric Analog Computer.*
- Lincoln Kearney Durst. (Mathematics and Physics), A.B., *University of California at Los Angeles*, 1945; B.S., *California Institute of Technology*, 1946. Thesis: *Partition and Periodicity Properties of Equianharmonic Divisibility Sequences.*
- Victor Elconin. (Mathematics and Physics), B.S., *California Institute of Technology*, 1933; M.S., 1935. Thesis: *Transformation of Linear Spaces and Linear Operators by Inverse Reversion.*

- George Leon Ellman. (Chemistry and Biology), B.S., *University of Illinois*, 1948; M.S., *Washington State College*, 1949. Thesis: I. Phosphate-Containing Compounds in Neurospora. II. Synthetic Substrates for Chymotrypsin.
- Gerald David Fasman. (Chemistry and Animal Physiology), B.Sc., *University of Alberta*, 1948. Thesis: I. A Reinvestigation of the Kinetics of the Urease Catalysed Hydrolysis of Urea. II. Attempted Purification of the Adrenocorticotrophic Hormone. III. Instrumental Adsorption Analysis. IV. The Effect of Diphenyl Hydantoin (Dilantin) on the Ether Narcosis in the Cat.
- Wildon Fickett. (Chemistry and Physics), B.S., *University of Arizona*, 1948. Thesis: Walden Inversions Involving the Isomeric 2, 3-Butanediamines and Related Compounds. An Experimental Test of Kirkwood's Theory of Optical Rotatory Power. Zero-Point Vibrational Contributions to the Optical Activity of Isotopically Asymmetric Molecules.
- Robert Joseph Foster. (Chemistry and Biology), B.S., *California Institute of Technology*, 1948. Thesis: The Monoacetylation of 2-4-Diamino-6-Nitro-Toluene. Kinetic Studies with Alpha-Chymotrypsin. The Effect of Dilantin upon Ether Narcosis in the Cat.
- Richard Jay Goldberg. (Chemistry and Biology), B.S., *Northwestern University*, 1945. Thesis: I. A Theory of Antibody-Antigen Reactions. II. The Light-Scattering Properties of an Antigen-Antibody Reaction. III. Light-Scattering Arising from Composition Fluctuations in Multi-Component Systems.
- Norman Everett Good. (Biochemistry and Plant Physiology), B.A., *University of Toronto*, 1948. Thesis: Lysine Metabolism in Neurospora.
- Jerry Grey. (Aeronautics and Mathematics), B.M.E., *Cornell University*, 1947; M.S., 1949. Thesis: The Effects of Air Condensation on Properties of Flow and Their Measurement in Hypersonic Wind Tunnels.
- John Burton Hatcher. (Biochemistry and Chemistry), B.S., *California Institute of Technology*, 1937; M.S., 1938. Thesis: The Course of Vitamin B₁ Metabolism in Man as Indicated by the Use of Radioactive Sulfur. A New Synthesis of 4-Methyl-5-Beta-Hydroxyethylthiazole. Demonstration of Anti-Coincidence Radioactive Counting Techniques.
- Harry Charles Hoyt. (Physics and Mathematics), B.S., *University of Colorado*, 1948. Thesis: Precision Wavelength Measurements of the Annihilation Radiation from Copper 64 and Gamma Radiation Following Decay of Gold 198 and Tantalum 182.
- Erdal Ismet İnönü (Physics and Mathematics), B.S., *University of Ankara*, 1947; M.S., *California Institute of Technology*, 1948. Thesis: Interpretation of Large Ionization Bursts Observed at High Altitudes in High Pressure Chambers under Thick Shields.
- George Scott Kenny. (Physics and Mathematics), B.S., *Seattle Pacific College*, 1941. Thesis: Gyromagnetic Ratios for Iron, Cobalt and Certain Binary Alloys of Iron, Cobalt and Nickel.
- B. Kenneth Koe. (Chemistry and Plant Physiology), B.S., *Reed College*, 1945. Thesis: I. The Isolation and Study of Some Naturally Occurring Fluorescent Organic Compounds. II. Stereoisomerization of Prolycopene, Pro-Gamma-Carotene, and Lycopene in Chickens and Hens.
- Edwin B. Kurtz, Jr. (Plant Physiology and Bio-Organic Chemistry), B.S., *University of Arizona*, 1947; M.S., 1949. Thesis: Studies on the Metabolism of Lipids in Plants.
- Freeman Beach Leighton. (Petrology and Glaciology), B.S., *University of Virginia*, 1946; M.S., *California Institute of Technology*, 1949. Thesis: I. Geology of the Vermiculite Deposits of the Gold Butte Mining District. II. 1. Ogives of the East Twin Glacier, Alaska—Their Nature and Origin. 2. Investigations in the Taku Glacier Firn, Alaska.
- Dan L. Lindsley, Jr. (Genetics and Animal Physiology), A.B., *University of Missouri*, 1947; M.A., 1949. Thesis: Some Consequences of Spermatogonial Exchange in Long Inversions of the X Chromosome of *Drosophila melanogaster*.
- James Leslie Liverman. (Plant Physiology and Bio-Organic Chemistry), B.S., *Agricultural and Mechanical College of Texas*, 1949. Thesis: The Physiology and Biochemistry of Flowering.

(DOCTOR OF PHILOSOPHY, cont.)

- Peilin Luo. (Electrical Engineering, Physics and Mathematics), B.S., *National Chiao-Tung University*, 1935. Thesis: *On the Theory of Salient Pole Alternators with Electromagnet and with Permanent Magnet Excitation.*
- Paul Beattie MacCready, Jr. (Aeronautics and Physics), B.S., *Yale University*, 1947; M.S., *California Institute of Technology*, 1948. Thesis: *Atmospheric Turbulence.*
- Robert Leslie Nelson. (Geophysics and Geomorphology), B.A., *Williams College*, 1948; M.S., *California Institute of Technology*, 1950. Thesis: I. *A Study of the Seismic Waves SKS and SKKS. II. Glacial Geology of the Frying Pan River Drainage, Colorado.*
- Joseph Lloyd O'Brien. (Chemistry and Animal Physiology), B.S., *University of Notre Dame*, 1948. Thesis: I. *The Ionization of Amino Acids and Other Polyfunctional Organic Compounds in the Solvent Sulfuric Acid.* II. *Studies on the Chemistry of Azlactones.* III. *Miscellaneous Observations on Amino Acid Derivatives.* IV. *The Nodal Silver Stain; Its Mechanism and Relation to the Potassium Loss of Isolated Nerve.*
- Robert Hunter Owens. (Mathematics and Physics), B.S., *Webb Institute of Naval Architecture*, 1944; M.A., *Columbia University*, 1948. Thesis: *An Asymptotic Study of a Class of Ordinary Linear Differential Equations of the Second Order.*
- Blaine R. Parkin. (Aeronautics and Mathematics), B.S., *California Institute of Technology*, 1947; M.S., 1948. Thesis: *Scale Effects in Cavitating Flow.*
- Earl Byron Patterson. (Genetics and Plant Physiology), B.S., *University of Nebraska*, 1947. Thesis: *Studies on Crossing Over in Homozygous and Heterozygous Chromosome Rearrangements in Zea mays.*
- Adrian Paw. (Civil Engineering and Mathematics), B.S., *University of Washington*, 1937. Thesis: *A Rational Design Procedure for Machine Foundations.*
- Richard Scott Pierce. (Mathematics and Physics), B.S., *California Institute of Technology*, 1950. Thesis: *Homomorphisms of Function Lattices.*
- Lloyd Charles Pray. (Stratigraphy and Petrology), B.A., *Carleton College*, 1941; M.S., *California Institute of Technology*, 1943. Thesis: I. *Stratigraphy of the Escarpment of the Sacramento Mountains, Otero County, New Mexico.* II. *The Mocam Basnaesite Deposit, San Bernardino County, California.*
- José Luis Reissig. (Genetics and Chemistry), B.S., *University of Michigan*, 1948. Thesis: *The Metabolism of Tbreonine and Related Substrates in Neurospora crassa.*
- Audre Richardson. (Physics and Mathematics), B.S., *California Institute of Technology*, 1943; M.S., 1946. Thesis: *The Theory of Low Velocity Inelastic Atomic Collisions.*
- Howard Murray Robbins. (Physics and Mathematics), B.Ph., *University of Minnesota*, 1947; M.A., 1948. Thesis: I. *Retardation Corrections in the Helium Atom.* II. *Self Energy in a Magnetic Field.*
- Paul George Rooney. (Mathematics and Physics), B.Sc., *University of Alberta*, 1949. Thesis: *Inversion and Representation Theorems for the Laplace Transformation.*
- Anatol Roshko. (Aeronautics and Physics), B.Sc., *University of Alberta*, 1945; M.S., *California Institute of Technology*, 1947. Thesis: *On the Development of Turbulent Wakes from Vortex Streets.*
- William Francis Sheehan, Jr. (Chemistry and Physics), B.S., *Loyola University*, 1948. Thesis: *Studies in Molecular Structure and Valence State Energy.*
- Leon Shenfil. (Physics and Mathematics), B.S., *California Institute of Technology*, 1947; M.S., 1948. Thesis: *Point Focusing X-Ray Monochromator for Low Angle Scattering Studies.*
- James Nelson Shoolery. (Chemistry and Physics), B.S., *University of California*, 1948. Thesis: *Studies in Microwave Spectroscopy.*
- George Foster Smith. (Physics and Electrical Engineering), B.S., *California Institute of Technology*, 1944; M.S., 1948. Thesis: *Thermionic Emission from and Surface Structure of Single Crystals of Tungsten.*

- Philip Standish Thayer. (Biochemistry and Chemistry), B.A., *Amherst College*, 1948; M.A., 1949. Thesis: *Studies on the L-Amino Acid Oxidase of Neurospora crassa*.
- Paul George Thiene, Jr. (Electrical Engineering and Physics), B.S., *California Institute of Technology*, 1943. Thesis: *Studies on Absorptive Transitions between Rotational Sublevels of Symmetric-Top Molecules in a Static Electric Field*.
- Thad Vreeland, Jr. (Mechanical Engineering and Electrical Engineering), B.S., *California Institute of Technology*, 1949; M.S., 1950. Thesis: *A Study of the Initiation of Yielding in Mild Steel*.
- Robert Douglas Waldron. (Chemistry and Mathematics), B.S., *University of Minnesota*, 1948. Thesis: *The Vibrational Spectrum of Organic Crystals: Urea, Thiourea, Glycine*.
- William W. Ward. (Electrical Engineering, Mathematics and Physics), B.S., *Agricultural and Mechanical College of Texas*, 1948; M.S., *California Institute of Technology*, 1949. Thesis: *Problems in Network Theory*.
- William Alfred Wenzel. (Physics and Mathematics), B.A., *Williams College*, 1944; M.S., *California Institute of Technology*, 1948. Thesis: *The Deuteron-Deuteron Reaction and the Stopping Cross Section of D₂O Ice Below 600 KEV*.
- James Reed Wilts. (Physics and Mathematics), B.S., *Iowa State College*, 1944; M.S., *California Institute of Technology*, 1949. Thesis: *Precision Measurement of Nuclear Energies Using the Non-Ferromagnetic Beta-Ray Spectrometer with Homogeneous Magnetic Field*.
- Frederick John Wolfram. (Animal Physiology and Biochemistry), A.B., *University of California*, 1949. Thesis: *On Saltatory Conduction in Peripheral Myelinated Nerve*.
- Theodore Yao-Tsu Wu. (Aeronautics and Mathematics), B.S., *National Chiao-Tung University*, 1946; M.S., *Iowa State University*, 1948. Thesis: *On Problems of Heat Conduction in a Compressible Fluid*.
- Harry L. Yakel, Jr. (Chemistry and Physics), B.S., *Polytechnic Institute of Brooklyn*, 1949. Thesis: *An Investigation of the Structures of Some Crystalline Peptides and the Synthetic Polypeptide Poly-gamma-Methyl-L-Glutamate*.
- Richard Davidson Young. (Physics and Electrical Engineering), B.A., *Princeton University*, 1945; M.S., *California Institute of Technology*, 1947. Thesis: *The R-F Thermal Radiation from the Sun*.
- Robert Walter Zwanzig. (Chemistry and Physics), B.S., *Brooklyn Polytechnic Institute*, 1948; M.S., *University of Southern California*, 1950. Thesis: I. *Quantum Hydrodynamics*. II. *Statistical Mechanical Theory of Light Scattering from Simple Non-Polar Fluids*.

Undergraduate Prize Awards



CONGER PEACE PRIZE ORATION

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

FIRST PRIZE:

Waheed Khan Ghauri

SECOND PRIZE:

D. Derk Swain



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:

Waheed Khan Ghauri

SECOND PRIZE:

Marvin Hyman



FREDERIC W. HINRICHS, JR., MEMORIAL AWARD

Established in 1948 by the Trustees of the Institute in memory of Frederic W. Hinrichs, Jr., member of the Institute Faculty and Dean, 1921 to 1944. The award is made annually to "the senior who, in the opinion of the undergraduate classes, 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."

THE RECIPIENT OF THE AWARD IS ANNOUNCED
EACH YEAR AT COMMENCEMENT



THOMAS HUNT MORGAN MEMORIAL AWARD

Established in 1951 by friends of the late Thomas Hunt Morgan, Nobel Laureate and first Chairman of the Division of Biology. The award is made annually on recommendation of the Division of Biology to "an outstanding graduate student" in biology receiving the degree of Doctor of Philosophy during the year.

THE RECIPIENT OF THE AWARD IS ANNOUNCED
EACH YEAR AT COMMENCEMENT