

CALIFORNIA
INSTITUTE
OF TECHNOLOGY

68*th Annual Commencement*

June 8, 1962

CALIFORNIA INSTITUTE OF TECHNOLOGY

Sixty-eighth
Annual
Commencement

FRIDAY AFTERNOON AT FOUR-THIRTY O'CLOCK
JUNE EIGHTH, NINETEEN SIXTY-TWO

ACADEMIC PROCESSION

Chief Marshal

HARVEY EAGLESON, Ph.D.

Assistant Marshals

DONALD S. CLARK, Ph.D. JAMES C. DAVIES, Ph.D.

RODMAN W. PAUL, Ph.D.

MARCHING ORDER

Division I

CANDIDATES FOR THE DEGREE OF BACHELOR OF SCIENCE

CANDIDATES FOR THE DEGREE OF MASTER OF SCIENCE

CANDIDATES FOR THE DEGREE OF AERONAUTICAL ENGINEER

CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Division II

THE FACULTY OF THE CALIFORNIA INSTITUTE

THE CHAIRMEN OF DIVISIONS

THE DIRECTORS OF LABORATORIES

THE TRUSTEES OF THE CALIFORNIA INSTITUTE

THE REPRESENTATIVE OF THE UNITED STATES AIR FORCE

THE COMMENCEMENT CHAPLAIN

THE PRESIDENT OF THE CALIFORNIA INSTITUTE

THE COMMENCEMENT SPEAKER

THE CHAIRMAN OF THE BOARD OF TRUSTEES

PROGRAM

California Institute of Technology
Sixty-eighth
Annual Commencement



PRESIDING: ROBERT L. MINCKLER
CHAIRMAN OF THE BOARD OF TRUSTEES

PRELUDE AND PROCESSIONAL The Caltech Band

INVOCATION Right Reverend Monsignor William E. North, Ph.D.
Church of Saint Philip the Apostle, Pasadena

COMMENCEMENT ADDRESS

“The Challenges of a Revolutionary Age” . Charles H. Percy, A.B.
Chairman of the Board, Bell & Howell Company

CONFERRING OF DEGREES . Lee A. DuBridge, Ph.D., Sc.D.
President of the California Institute of Technology

PROGRAM—*continued*

PRESENTATION OF CANDIDATES FOR DEGREES

For the degree of Bachelor of Science . . . Paul Conant Eaton, A.M.
Dean of Students

For the degree of Master of Science . . . Milton S. Plesset, Ph.D.
Chairman of the Curriculum Committee

For the degree of Engineer . . . Frederic Bohnenblust, Ph.D.
Dean of Graduate Studies

For the degree of Doctor of Philosophy . . . Dean Bohnenblust

COMMISSIONING OF AIR FORCE RESERVE OFFICERS

Presentation of Cadets . . . Major Lorrin C. Peterson, B.S., M.B.A.
Professor of Air Science

Oath of Office and award of Certificate of Commission as Second
Lieutenants in the Air Force Reserve . Brigadier General H. K. Kelley
United States Air Force

CONCLUDING REMARKS President DuBridge

BENEDICTION Monsignor North

RECESSIONAL . *Organist:* James H. Shearer, A.R.C.M., A.R.C.O.

*The audience is requested to remain standing until
the end of the Recessional*

Candidates for Degrees

BACHELOR OF SCIENCE

Bruce Reggie Abell, *Los Angeles, California*. Geology.
Ahmad Khalil Abu-Shumays, *Beirut, Lebanon*. Engineering.
Lawrence Jay Altman, *Chicago, Illinois*. Chemistry.
John Theodore Armstrong, Jr., *Lemoore, California*. Engineering.
John Henry Arndt, Jr., *San Rafael, California*. Chemical Engineering.
Ray Charles Barglow, *Denver, Colorado*. Physics.
Carl Edward Baum, *Syracuse, New York*. Engineering.
Lon Edward Bell, *Santa Cruz, California*. Mathematics.
Rupert Charles Bell, *Grand Rapids, Michigan*. Physics.
David Bernard Benson, *Los Alamos, New Mexico*. Engineering.
Allen Lee Berman, *Culver City, California*. Physics.
Allen Richard Bernstein, *Chicago, Illinois*. Mathematics.
John William Berry, Jr., *Corpus Christi, Texas*. Biology.
Thomas Robert Blakeslee, *Winnetka, Illinois*. Engineering.
Robert Louis Blinkenberg, *Minneapolis, Minnesota*. Physics.
Ronald David Boettcher, *Buena Park, California*. Engineering.
Richard Charles Brandt, *Swarthmore, Pennsylvania*. Physics.
Richard Craig Brosi, *Janesville, Wisconsin*. Chemical Engineering.
Stephen Whitney Bruenn, *Riverdale, New York*. Physics.
Robert Bernard Bump, *Cherry Hills, Colorado*. Engineering.
Richard Gary Burke, *Pasadena, California*. Engineering.
Robert Marvin Cadwell, *Evanston, Illinois*. Engineering.
David G. Carta, *Pasadena, California*. Physics.
Gary Craig Chamness, *Santa Barbara, California*. Biology.
Dick Mei Chang, *Hong Kong, British Crown Colony*. Physics.
Wilfred Peter Charette, *Lincoln, New Hampshire*. Engineering.
Seung Chul Choy, *Seoul, Korea*. Physics.
Joseph Carl Christensen, *Manhattan Beach, California*. Engineering.
Reginald Willis Clemens, *Hollywood, California*. Physics.
Edward Thomas Cline, Jr., *Downers Grove, Illinois*. Mathematics.
Gerald Wayne Clough, *Concord, California*. Engineering.
James Edward Cordes, *Temple City, California*. Engineering.
Matthew Miller Couch, *Pasadena, California*. Chemistry.
Thomas Edwin Creighton, *St. Louis, Missouri*. Biology.
John Dean Crossman, *Squantum, Massachusetts*. Engineering.
Steven Collins Crow, *Arcadia, California*. Engineering.
John Delafield Curtis, *Washington, D.C.* Astronomy.
Alan Bernard Darger, *Sacramento, California*. Physics.
Ted H. Davey, *Phoenix, Arizona*. Engineering.
James I. Davis, *Los Angeles, California*. Physics.

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

BACHELOR OF SCIENCE—continued

- Larry Ralph Dawson, *Sunnymead, California*. Engineering.
Lonnie Keith DeMent, *Mt. Prospect, Illinois*. Chemical Engineering.
Kerry Lane Donovan, *Arlington, Virginia*. Biology.
David Willis Drummond, *Chicago, Illinois*. Biology.
David Kitzmiller Edwards III, *Lexington, Kentucky*. Biology.
Lee Edward Elliott, *Topeka, Kansas*. Engineering.
Peter George Eltgroth, *Tujunga, California*. Physics.
William Richard Emerson, *Los Angeles, California*. Mathematics.
Victor Solomon Engleman, *Northport, New York*. Chemical Engineering.
William Elliston Farrell, *Long Beach, California*. Physics.
Stanley Martin Flatte, *Los Angeles, California*. Physics.
Charles Milton Flynn, Jr., *Sherman Oaks, California*. Chemistry.
Peter Campbell Ford, *Porterville, California*. Chemistry.
Gary Scott Fraley, *Atascadero, California*. Physics.
Samuel Theodore Furr, *Los Angeles, California*. Engineering.
Ronald Frank Gebhardt, *Coos Bay, Oregon*. Geology.
Porter Dean Gerber, *Santa Fe, New Mexico*. Mathematics.
Robert Gershman, *Scranton, Pennsylvania*. Chemical Engineering.
John Robert Golden, *Des Moines, Iowa*. Engineering.
Barry Alan Gordon, *Los Altos, California*. Physics.
Charles Sherman Gratch, *Chicago, Illinois*. Physics.
Donald William Green, *Pasadena, California*. Physics.
Neil Edward Gretskey, *Boston, Massachusetts*. Mathematics.
Randall Bertram Griep, *Redondo Beach, California*. Biology.
David Cantrell Grimes, *Burbank, California*. Engineering.
John Moss Grover, *Annapolis, Maryland*. Mathematics.
Harrison Babcock Hall, *Encino, California*. Engineering.
Frederick John Hameetman, *Lomita, California*. Engineering.
Carl Wayne Hamilton, *West Plains, Missouri*. Mathematics.
Lyndon Maurice Hardy, *Los Angeles, California*. Physics.
Vincent Charles Hascall, Jr., *Longmont, Colorado*. Biology.
William Verne Hassenzahl, *Bell Gardens, California*. Physics.
Robert Henderson Hearn, *Phoenix, Arizona*. Engineering.
Stephen Fox Heinemann, *Cambridge, Massachusetts*. Biology.
Joseph Heller, *Santa Monica, California*. Mathematics.
David Nelson Herting, *Ventura, California*. Engineering.
Richard Irwin Hess, *Los Angeles, California*. Physics.
Howard Thorndike Hilton, *San Gabriel, California*. Physics.
William John Hogan, *Riverside, California*. Physics.
Charles Henry House, *Pasadena, California*. Engineering.
Evan Eugene Hughes, Jr., *Los Angeles, California*. Physics.
Wendell Yau Git Ing, *Honolulu, Hawaii*. Physics.
Lester Ingber, *Brooklyn, New York*. Physics.
James Hayden Johnson, *Oxnard, California*. Physics.
Arnold Richard Jones, *Manhattan, Kansas*. Engineering.
Roy Scott Jordan, *Clinton, Iowa*. Engineering.

BACHELOR OF SCIENCE—*continued*

Howard Arthur Kabakow, *Los Angeles, California*. Physics.
David Kauffman, *Jenkintown, Pennsylvania*. Chemical Engineering.
William Chung King, *Hong Kong, British Crown Colony*. Engineering.
James Dean Klett, *Los Angeles, California*. Physics.
Robert Koh, *Allentown, Pennsylvania*. Engineering.
Lawrence Dean Kugler, *San Jacinto, California*. Mathematics.
Harold Charles Kurtz, *Rockville Center, New York*. Mathematics.
Michael Logan Lampton, *Santa Monica, California*. Physics.
Robert George Langsner, *Sacramento, California*. Mathematics.
Kenneth Curtis Larson, *Kirkland, Washington*. Chemical Engineering.
Peter Alan Laszlo, *Beverly Hills, California*. Mathematics.
Miguel Enrique Levy, *San Salvador, El Salvador*. Engineering.
Robert Peichung Lin, *Los Angeles, California*. Physics.
Stuart Michael Linn, *Los Angeles, California*. Chemistry.
Thomas James Litle IV, *Grosse Point, Michigan*. Engineering.
Gary Allen Lorden, *Los Angeles, California*. Mathematics.
Arthur Charles Ludwig, *Sun Valley, California*. Engineering.
Waldemar Traugott Lungershausen, Jr., *Detroit, Michigan*. Astronomy.
Alexander Newell Lyon, *Huntington, New York*. Chemistry.
Robert Jerome Manning, *Dallas, Texas*. Physics.
Etan Markowitz, *Los Angeles, California*. Mathematics.
Harold Everett Marr III, *Searsport, Maine*. Chemistry.
Franklin Lester Marshall, *Burbank, California*. Engineering.
Garland Ross Marshall, *College Station, Texas*. Biology.
Keith Matthews, *Staten Island, New York*. Physics.
Arthur Francis McGarr III, *Portland, Oregon*. Physics.
Daniel Webster McMorris, *Los Angeles, California*. Physics.
Lauren Vail Merritt, *Kensington, California*. Engineering.
Peter Lee Metcalf, *Los Angeles, California*. Chemical Engineering.
Edward Standish Miller, *Berkeley, California*. Physics.
Gary Francis Mitchell, *Glen Ellyn, Illinois*. Chemistry.
Ralph Crittenden Moore, *Denver, Colorado*. Physics.
James Marshall Moorhead, *San Mateo, California*. Astronomy.
Frank Edward Mullin, *Los Gatos, California*. Mathematics.
John Anthony Newmeyer, *Los Angeles, California*. Physics.
Donald Arthur Nisewanger, *Orange Cove, California*. Physics.
Julian Victor Noble, *Roslyn Heights, New York*. Physics.
Roger Gordon Noll, *Oceanside, California*. Mathematics.
David Justin Osias, *Chevy Chase, Maryland*. Physics.
Bunso Otani, *Altadena, California*. Engineering.
William E. Palke, *St. Petersburg, Florida*. Chemistry.
Michael Thomas Palmiter, *Alhambra, California*. Mathematics.
Julian Frederick Prince, *Newton, Massachusetts*. Mathematics.
David Edward Pritchard, *Haddonfield, New Jersey*. Physics.
Charles Howard Radoy, *Los Angeles, California*. Engineering.
Frank Ridolphi, *Montgomery, Alabama*. Engineering.

BACHELOR OF SCIENCE—*continued*

- David Herbert Rogstad, *Los Angeles, California*. Physics.
Daniel Fredric Romm, *Los Angeles, California*. Mathematics.
George Robert Root, Jr., *Arcadia, California*. Engineering.
Robert Talman Ross, *San Marino, California*. Chemistry.
Robert Henry Rouda, *Los Angeles, California*. Chemistry.
Carl M. Rovainen, *Excelsior, Minnesota*. Biology.
Robert Charles Ruddick, *Houston, Texas*. Physics.
John Christian Russ, *Philadelphia, Pennsylvania*. Engineering.
Robert Kent Russell, *Fullerton, California*. Engineering.
Peter T. Rux, *Van Nuys, California*. Physics.
George Thomas Sallee, *Nyssa, Oregon*. Mathematics.
Lawrence Neal Seeley, *Freeport, Texas*. Mathematics.
David Lee Sellin, *Milwaukee, Wisconsin*. Physics.
Douglas Smith, *St. Joseph, Missouri*. Geology.
Gaetan Joseph St-Cyr, *East Hampton, Connecticut*. Engineering.
William Charles Straka, *Phoenix, Arizona*. Astronomy.
Nelson Peter Svegel, *Phoenix, Arizona*. Engineering.
Robert James Tait, *Burbank, California*. Engineering.
Lance Jerome Taylor, *Montpelier, Idaho*. Mathematics.
Warren Teitelman, *Miami, Florida*. Mathematics.
Joel Tenenbaum, *Queens Village, New York*. Physics.
Don Ray Thompson, *Little Rock, Arkansas*. Physics.
Kip Stephen Thorne, *Logan, Utah*. Physics.
William Frederic Tivol, *San Francisco, California*. Physics.
Michael Jellison Townsend, *Sherman Oaks, California*. Engineering.
Gary Burgess Turner, *Phoenix, Arizona*. Engineering.
William Henry Weihofen, *Albuquerque, New Mexico*. Physics.
Frederick Wesley Weingarten, Jr., *Covina, California*. Engineering.
Albert Charles Whittlesey, *Portland, Oregon*. Physics.
Robert Stephen Williams, *Baton Rouge, Louisiana*. Physics.
Hal Holcomb Wyman, *Seattle, Washington*. Mathematics.
Joel R. Yellin, *Lakewood, California*. Physics.
James Yoh, *New York, New York*. Engineering.
Geary Ralph Younce, *Hillsboro, Oregon*. Engineering.
Albert Richard Zacher, Jr., *Fresno, California*. Physics.
Alan Zame, *Coral Gables, Florida*. Mathematics.

MASTER OF SCIENCE IN SCIENCE

Astronomy

Glenn LeRoy Berge. *B.A., Luther College, 1960.*
Manuel E. Mendez. *B.S., University of Mexico, 1960.*

Chemistry

Bernard Foran. *B.Sc.(General), London University, 1951; B.Sc.(Special), 1952.*
Seymour Alvin Rapaport. *B.S., California Institute of Technology, 1957; M.D., The Johns Hopkins University School of Medicine, 1961.*
Masaaki Takahashi. *B.S., Tohoku University, 1955.*

Chemical Engineering

Thomas Elöd Berty. *Dipl. M.E., Polytechnical University of Budapest, 1954.*
Shiou-Shan Chen. *Dipl., Taipei Institute of Technology, 1958.*
Dennis Jerome Graue. *B.S., University of Colorado, 1961.*
Johannes Huisman. *Associateship Dipl. in Applied Chemistry, Royal Melbourne Technical College, 1956; Associateship Dipl. in Chemical Engineering, 1959.*
John James Kennedy. *B.S., California Institute of Technology, 1961.*
Roy Nathan Levitch. *B.Ch.E., Rensselaer Polytechnic Institute, 1961.*
Chung-Chiun Liu. *B.S., Cheng-Kung University, 1959.*
William Joseph Moore. *S.B., Massachusetts Institute of Technology, 1958.*
Milton Edward Morrison. *B.S., Iowa State University, 1961.*
Wei-yu Francis Wang. *B.S., California Institute of Technology, 1961.*

Geology

Stewart Douglas McDowell. *B.S., Pennsylvania State University, 1960.*
David Lawrence Schleicher. *B.S., Pennsylvania State University, 1959.*

Geochemistry

Dennis Roland Wik. *B.S., Beloit College, 1960.*

Geophysics

Alexander Franklin Hermann Goetz. *B.S., California Institute of Technology, 1961.*
Jean Marie Noël. *Dipl., Université de Strasbourg, 1961.*
Robert James Quigley. *B.S., California Institute of Technology, 1961.*

Mathematics

James Secord Howland. *B.S., University of Florida, 1959.*
Robert Leroy Kruse. *B.A., Pomona College, 1960.*

MASTER OF SCIENCE IN SCIENCE—*continued*

Physics

- David George Agresti. *B.S., The Ohio State University, 1959.*
Norman Webster Albright. *B.S., California Institute of Technology, 1956.*
Donald Milford Baker. *B.S., University of Colorado, 1960.*
Larry Dean Fitzgerald. *B.S., United States Military Academy, 1956.*
Paul Walton Purdom, Jr. *B.S., California Institute of Technology, 1961.*
Harvey Kenneth Shepard. *B.S., University of Illinois, 1960.*
Henry Archer Thiessen. *B.S., California Institute of Technology, 1961.*

MASTER OF SCIENCE IN ENGINEERING

Aeronautics

- Nazeer Ahmed. *B.E., University of Mysore, 1961.*
Anthony Bedford. *B.S., University of Texas, 1961.*
Jean-Pierre Dorlhac. *Dipl. d'Ing. de l'Aeronautique, Ecole Nationale Superieure de l'Aeronautique, 1961.*
Joseph Paul Giesing. *B.S., University of Colorado, 1961.*
Scott Edwin Gilles. *B.S., University of Kansas, 1961.*
J. Stuart Keith. *B.S., The Rice Institute, 1958.*
John Michael Klineberg. *B.S.E., Princeton University, 1960.*
Joseph Carby Mendez, Jr. *B.A.E., Georgia Institute of Technology, 1961; M.S., 1962.*
John Fletcher Murphy. *B.S., University of Notre Dame, 1957.*
John Louis Porter. *B.S., University of Kansas, 1961.*
Paul Ridder Rupert. *B.S., University of Oklahoma, 1961.*
Stottler King Starr. *B.S., Purdue University, 1961.*
Charles Fleming Stebbins. *B.S., United States Air Force Academy, 1961.*
Floyd Ronald Stuart. *B.S., United States Naval Academy, 1957.*
Viviane Claude Tatin. *Dipl. d'Ing. de l'Aeronautique, Ecole Nationale Superieure de l'Aeronautique, 1961.*
Richard R. Williams. *B.S., Purdue University, 1961.*

Applied Mechanics

- Clark Reid Barker. *B.S.M.E., Bradley University, 1961.*

Civil Engineering

- Clement Charles Audet. *B.Sc.A., Universite Laval, 1960.*
Carlos Miguel Campuzano. *B.S., University of Kansas, 1959.*
Robert Glen Coyer. *B.S., Tufts University, 1961.*
Gidali Gutner. *Dipl. d'Ing., Ecole Nationale d'Ingenieurs des Arts et Metiers, 1961.*

MASTER OF SCIENCE IN ENGINEERING—continued

Electrical Engineering

- Ward Calaway. *B.S., California Institute of Technology, 1961.*
Tsiu Chiu Chan. *B.Eng., McGill University, 1961.*
Robert Gorham Chapman, Jr. *B.S.E., Princeton University, 1961.*
Donald Henry Close. *B.S., University of Kansas, 1960.*
Michel M. Cousin. *Dipl. d'Ing., Ecole Nationale Supérieure Telecommunications, 1961.*
Michel d'Arbaumont. *Dipl. d'Ing., Ecole Nationale Supérieure Telecommunications, 1961.*
Kirk Montell Dawson. *A.B., Occidental College, 1961; B.S., California Institute of Technology, 1961.*
Rodney Devon Dokken. *B.S., California Institute of Technology, 1961.*
Richard Harold Drew. *B.S., California Institute of Technology, 1961.*
Jean Claude Dubois. *Dipl. d'Ing. Civil Electricien-Mecanicien, Université Catholique de Louvain, 1958.*
Richard Carl Eden. *B.S., Iowa State University, 1961.*
Claude Michel Alain Fugere. *Dipl. d'Ing., Ecole Nationale d'Ingenieurs Arts et Metiers, 1961.*
Alfred Frans Gort. *Cand., Technische Hageschool (Eindhoven), 1962.*
Clovis Roland Haden. *B.S., Arlington State College, 1961.*
Stanley Richmond Harrison. *B.S., California Institute of Technology, 1948.*
Milton Jay Kimmel. *B.S., California Institute of Technology, 1956; B.D., Fuller Theological Seminary, 1959.*
Ronald Allan Kleban. *B.S., California Institute of Technology, 1961.*
Curtis Frederick Kuebler. *B.S., California Institute of Technology, 1961.*
Bruce Thomas Kujawski. *B.S., Case Institute of Technology, 1961.*
Guy Jean Lafont. *Dipl. de Mathematiques Generales, Université de Paris, 1958; Dipl. d'Ing., Ecole Supérieure d'Electricite de Paris, 1961.*
Orval George Lorimor. *B.S., Iowa State University, 1961.*
Helmut K. V. Lotsch. *Dipl. Ing., Technische Hochschule (Karlsruhe), 1958.*
Bruce Albright Lovell. *B.E.E., Rensselaer Polytechnic Institute, 1961.*
Donald Edward Mack. *B.E.E., Union College, 1957.*
Osorio Chagas Meirelles. *B.Sc., Universidade do Brasil, 1960.*
Albert Watts Merrill. *B.S., California Institute of Technology, 1961.*
Padraic Declan O'Riordan. *B.E., National University of Ireland (Cork), 1959.*
Dennis Lorin Paull. *B.S., California Institute of Technology, 1959.*
Jean Claude Rivet. *Dipl. d'Ing., Ecole Supérieure d'Electricite de Paris, 1961.*
Michael Richard Ruecker. *B.S., California Institute of Technology, 1961.*
William Keith Shubert. *B.S., California Institute of Technology, 1961.*
John Robert Smith. *B.S., California Institute of Technology, 1961.*
John Paul Stenbit. *B.S., California Institute of Technology, 1961.*
Raynold Allen Svenson. *B.S., Michigan College of Mining and Technology, 1961.*
David Price Turner. *B.S., California Institute of Technology, 1961.*
Christ Orlando Velline. *B.S., California Institute of Technology, 1961.*
Gustav Nicholas Wassel. *B.S., California Institute of Technology, 1960.*
Martin Cameron Watson. *B.S.E., Princeton University, 1961.*
Maurice Vincent Whelan. *B.E., National University of Ireland (Cork), 1960.*
Jerry Doane Woods. *B.S., California Institute of Technology, 1961.*

MASTER OF SCIENCE IN ENGINEERING—*continued*

Engineering Science

Robert E. Singleton. *B.S., North Carolina State College of Agriculture and Engineering, 1960.*

Materials Science

Don Paul Clausing. *B.S., Iowa State College, 1952.*

Donald Bozell Forrest. *B.S., California Institute of Technology, 1961.*

William Franklin Greenman. *B.S., California Institute of Technology, 1960.*

John Raymond Hribar. *B.S., California Institute of Technology, 1961.*

Ronald Keith Linde. *B.S., University of California, 1961.*

David Peter Pope. *B.S., University of Wisconsin, 1961.*

Om Parkash Puri. *B.Sc., Panjab University, 1950; M.Sc., 1951.*

John Burgess Trenholme. *B.S., California Institute of Technology, 1961.*

Mechanical Engineering

Vincent George Aquino. *B.S., University of Portland, 1957.*

Robert Hugh Brown. *B.S., Bucknell University, 1961.*

Ben Graham Burke. *B.S., California Institute of Technology, 1961.*

Terrill Alan Cool. *B.S., University of California, 1961.*

John Edward Fischer. *B.M.E., Rensselaer Polytechnic Institute, 1961.*

Lawrence William Hallanger. *B.S., Harvey Mudd College, 1961.*

Paul Yu-fei Hu. *B.S., University of Maryland, 1961.*

Marlyn T. Jakub. *B.S., Carnegie Institute of Technology, 1958.*

Robert Joe Johnson. *B.M.E., Georgia Institute of Technology, 1958.*

David Walter Kendle. *B.S., California Institute of Technology, 1961.*

Hugh Kendrick. *B.Sc., University of London, 1961.*

Hans Ludewig. *B.Sc., University of Natal, 1960.*

Sami Faiz Masri. *B.S., University of Texas, 1960; M.S., 1961.*

Jackie Ross McInturff. *B.E., Vanderbilt University, 1960.*

Stanley Brun Mellisen. *B.Sc., University of Alberta, 1961.*

Edward Otto Moeck. *B.Sc., Queen's University, 1961.*

Carlos William Moreno. *B.S., Case Institute of Technology, 1961.*

Neil Ray Richardson. *B.S., California Institute of Technology, 1961.*

John Charles Stansel. *B.S., University of Utah, 1961.*

AERONAUTICAL ENGINEER

- John Carl Casey, Major, U.S.A.F. B.S., *Purdue University, 1955; M.S., California Institute of Technology, 1961.*
- Douglas Stoddard Johnson, Capt., U.S.A.F. B.S., *United States Military Academy, 1956; M.S., California Institute of Technology, 1961.*
- Grant Reed Johnson, Lt., U.S.N. B.S., *University of Utah, 1955; B.S., United States Naval Postgraduate School, 1961.*
- Werner Preukschat. *Dipl. Ing., Technische Hochschule (Aachen), 1959.*
- Kendrick Radey. *B.S.Ae.,E., University of Texas, 1947; M.S., California Institute of Technology, 1951.*
- Marc L. Renard. *I.C.M.E., Faculte Polytechnique de Hons (Belgium), 1959; I.Co.Ae., Universite Libre de Bruxelles, 1960.*
- Stuart Blackton Savage. *B.Eng. (Hons), McGill University, 1960; M.S., California Institute of Technology, 1961.*
- Ernest Richard Seymour, Lt., U.S.N. B.S., *United States Naval Academy, 1953; B.S., United States Naval Postgraduate School, 1961.*
- Jerry Lee Simmons. *B.S., University of Kansas, 1959; M.S., 1960.*
- George Arthur Watts. *M.A.Sc., University of Toronto, 1956.*

DOCTOR OF PHILOSOPHY

Frank Addison Albini (Mechanical Engineering and Philosophy). *B.S., California Institute of Technology, 1958; M.S., 1959.*

Thesis: I. Relaxation Time of One-Dimensional, Lamina-Deflagration for First Order Reactions.

II. Reflection and Transmission of Electromagnetic Waves at Electron Density Gradients.

Ethan Davidson Alyea, Jr. (Physics and Mathematics). *A.B. Princeton University, 1953.*

Thesis: Photoproduction of K^0 Mesons from Carbon—A Freon Bubble Chamber Experiment.

Don Lynn Anderson (Geophysics and Mathematics). *B.S., Rensselaer Polytechnic Institute, 1955; M.S., California Institute of Technology, 1959.*

Thesis: Surface Wave Propagation in Layered Anisotropic Media.

Charles Dwight Babcock, Jr. (Aeronautics and Mathematics). *B.S., Purdue University, 1957; M.S., California Institute of Technology, 1958.*

Thesis: The Buckling of Cylindrical Shells with an Initial Imperfection under Axial Compression Loading.

William Frederick Beach (Chemistry). *B.S., Rutgers University, 1957.*

Thesis: The Structure and Biogenesis of Nidulin.

Ronald David Bercov (Mathematics). *B.Sc. (Hons), University of Alberta, 1959.*

Thesis: The Double Transitivity of a Class of Permutation Groups.

Ronald Edmund Brown (Physics). *B.S., University of Washington, 1956.*

Thesis: A Study of the $O^{17}(p,\alpha)N^{14}$ Reaction.

Wilbur Parker Brown, Jr. (Electrical Engineering and Physics). *B.S.E., University of Michigan, 1957; M.S.E., 1958.*

Thesis: A Theoretical Study of the Scattering of Electromagnetic Impulses by Finite Obstacles.

Robert Everett Carter (Chemistry, Biology). *A.B., Columbia College (New York), 1958.*

Thesis: I. The Biogenesis of Phenazine Pigments.

II. Beta-Ferrocenyl Carbonium Ions.

III. Chemical Shift and π -Electron Densities.

David Bing Jue Chang (Physics). *B.S., University of Washington, 1956.*

Thesis: Synchrotron Radiation as the Source of the Polarized Decimeter Radiation from Jupiter.

DOCTOR OF PHILOSOPHY—*continued*

Tseng-Hsu Chang (Physics). *B.S., Columbia University, 1955.*

Thesis: The Ratio of π^0 Photoproductions from Neutrons and Protons in Deuterium in the Energy Range of 700 to 1100 mev.

Hung Cheng (Physics). *B.S., California Institute of Technology, 1959.*

Thesis: Spin Absorption of Solids.

Donald Delbert Clayton (Physics). *B.S., Southern Methodist University, 1956; M.S., California Institute of Technology, 1959.*

Thesis: Studies of Certain Nuclear Processes in Stars.

I. Neutron Capture Chains in Heavy Element Synthesis.

II. A Search for Excited States in N^{14} Pertaining to the Synthesis of C^{13} .

Richard Lewis Cohen (Physics). *B.S., Haverford College, 1957; M.S., California Institute of Technology, 1959.*

Thesis: Mössbauer Effect in Thulium¹⁶⁹.

Sidney Richard Coleman (Physics). *B.S., Illinois Institute of Technology, 1957.*

Thesis: The Structure of Strong Interaction Symmetries.

James Ekstedt Conel (Geology). *B.A., Occidental College, 1955; M.S., California Institute of Technology, 1957.*

Thesis: Studies on the Development of Fabrics in Some Naturally Deformed Limestones.

Benjamin Edgar Cummings (Aeronautics). *B.S., California Institute of Technology, 1955; M.S., 1956; Ae.E., 1957.*

Thesis: Some Nonlinear Vibration and Response Problems of Cylindrical Panels and Shells.

Melvin Drew Daybell (Physics). *B.S., New Mexico State University, 1956.*

Thesis: The Photoproduction of Positive K Mesons in Hydrogen at Large Center of Mass Angles.

Aldo Gene Di Loreto (Electrical Engineering and Physics). *B.S., California Institute of Technology, 1956; M.S., 1957.*

Thesis: Noise Optimization Techniques for Linear Transistor Amplifiers.

William Franklin Dove, Jr. (Chemistry). *A.B., Amherst College, 1958.*

Thesis: The Helix-Coil Transition in DNA: Effects of Small-ion Interactions and DNA Composition.

Everett Truman Eiselen (Mechanical Engineering and Physics). *B.S., California Institute of Technology, 1956; M.S., 1957.*

Thesis: Sound Propagation in Small Diameter Tubes.

DOCTOR OF PHILOSOPHY—*continued*

Christian Albertus Engelbrecht (Physics). *B.Sc., University of Pretoria, 1955.*

Thesis: Photoproduction of Neutral Pions in Complex Nuclei.

James Lawrence Collier Ford, Jr. (Physics). *B.A., Montana State University, 1955; M.S., California Institute of Technology, 1959.*

Thesis: The Elastic Scattering of Deuterons by Li⁷.

Donald Charles Garwood (Chemistry). *B.A., Kalamazoo College, 1957.*

Thesis: Electrophilic Aromatic Substitution of Metallocenes, Stereochemistry of Halogen Addition to 4-1-Butylcyclohexene, Lithium Aluminum Hydride Reduction of CIS-2, 6-Dimethylcyclohexanone.

Richard Morris Goldstein (Electrical Engineering and Physics). *B.S., Purdue University, 1947; M.S., California Institute of Technology, 1959.*

Thesis: Radar Exploration of Venus.

R. Clive Greenough (Chemistry). *S.B., Massachusetts Institute of Technology, 1953.*

Thesis: I. The Distribution of Antimony (III) between Hydrochloric Acid and Isopropyl Ether.

II. The Infrared Spectra and Probable Structures of Some Nitrogen-Sulfur Compounds.

George Drake Guthrie (Biophysics). *A.B., Wabash College, 1954.*

Thesis: Studies on the Interaction of Subviral Particles of the Bacteriophage phi X 174 with Protoplasts of *Escherichia coli*.

Andrew Guttman (Mechanical Engineering and Physics). *B.S., College of the City of New York, 1957; M.S., California Institute of Technology, 1958.*

Thesis: I. Quantitative Studies of the NO₂—N₂O₄ System in the Infrared.

II. Emission of Diffuse Bands of Sodium Behind Shock Fronts.

Alfred Washington Hales (Mathematics). *B.S., California Institute of Technology, 1960.*

Thesis: On the Nonexistence of Free Complete Boolean Algebras.

Peter Edgar Hare (Geochemistry). *B.S., Pacific Union College, 1954; M.S., University of California, 1955.*

Thesis: The Amino Acid Composition of the Organic Matrix of Some Recent and Fossil Shells of Some West Coast Species of *Mytilus*.

William David Hobey (Chemistry and Physics). *B.S., Tufts University, 1957.*

Thesis: Vibronic Interactions in Conjugated Systems.

David Parks Hault (Aeronautics, Physics). *S.B., Massachusetts Institute of Technology, 1957; M.S., California Institute of Technology, 1958.*

Thesis: Magnetohydrodynamic Surface Waves.

DOCTOR OF PHILOSOPHY—*continued*

Merlin E. H. Howden (Chemistry and Physics). *B.Sc. (Hons), University of Sydney, 1958.*

Thesis: I. Carbonion- and Free Radical-Type Rearrangements in Homoallylic Systems.
II. Nuclear Magnetic Resonance in Cyclopropanes.

Elisha Rhodes Huggins (Physics). *S.B., Massachusetts Institute of Technology, 1955.*

Thesis: Quantum Mechanics of the Interaction of Gravity with Electrons: Theory of a Spin-two Field Coupled to Energy.

James Brown Ifft (Chemistry). *B.S., Pennsylvania State University, 1957.*

Thesis: A Quantitative Examination of the Buoyant Behavior of Macromolecules of Known Molecular Weight in a Density Gradient at Equilibrium in the Ultracentrifuge.

Philip Ray Kennicott (Chemistry and Physics.) *B.S., University of Utah, 1953.*

Thesis: Studies in Infrared Spectroscopy.

Kenneth Robert King (Materials Science and Physics). *B.S., California Institute of Technology, 1953; M.S., 1954.*

Thesis: Dynamic Shear Deformation in Zinc Crystals.

William Klement, Jr. (Engineering Science). *B.S., California Institute of Technology, 1958.*

Thesis: Metastable Structures in Alloys Rapidly Cooled from the Melt.

Joseph Kohler (Mathematics). *B.Sc., Ohio State University, 1957.*

Thesis: Finite Groups with All Maximal Subgroups of Prime or Prime Square Index.

Robert Louis Kovach (Geophysics). *Gp.Engr., Colorado School of Mines, 1955; M.A., Columbia University, 1959.*

Thesis: Geophysical Investigations in the Colorado Delta Region.

William Koziicki (Chemical Engineering and Chemistry). *B.A.Sc., University of Toronto, 1953; M.A.Sc., 1957.*

Thesis: I. Enthalpy Change upon Vaporization of the Hydrocarbons n-Pentane, Cyclohexane and 1-Butane.
II. Evaluations of Diffusion Coefficients for the Methane-n-Butane System Based on Gradients in Thermodynamic State Properties.

Marvin Alder Lanphere (Geology). *B.S., Montana School of Mines, 1955; M.S., California Institute of Technology, 1956.*

Thesis: I. Geology of the Wildrose Area, Panamint Range, California.
II. Geochronologic Studies in the Death Valley-Mojave Desert Region.

Kaye Don Lathrop (Mechanical Engineering and Physics). *B.S., United States Military Academy, 1955; M.S., California Institute of Technology, 1959.*

Thesis: Neutron Thermalization in Solids.

DOCTOR OF PHILOSOPHY—*continued*

Peter Anthony Leermakers (Chemistry). *B.A., Wesleyan University, 1958.*

- Thesis: I. Chemistry of Low Energy π - π^* Triplet States. The Photoproduction of 1-Naphthaldehyde and 2-Acetonaphthone.
II. Triplet-Triplet Energy Transfer in Solution.

Chung-Yen Liu (Aeronautics). *B.S., Taiwan College of Engineering, 1955; M.S., Brown University, 1958.*

- Thesis: I. Kinetic Theory Description of Plane, Compressible Couette Flow.
II. Kinetic Theory Description of Conductive Heat Transfer from a Fine Wire.

James Reily Lloyd (Mechanical Engineering). *B.S., California Institute of Technology, 1956; M.S., 1957.*

- Thesis: Wave Propagation in an Elastic Plate Resting on an Elastic Foundation.

Kenneth Lock (Electrical Engineering and Physics). *B.Sc., Battersea Polytechnic Institute (London), 1955; M.Sc., Imperial College of London, 1957.*

- Thesis: A Digital-Computer-Programmed Topological Method of Coordinate Selection for Numerical Computations in an Electrical Network.

Raymond Paul Lutz (Chemistry). *B.S., University of Florida, 1953; M.S., 1955.*

- Thesis: I. Mechanism of the Rearrangement of Fenchone.
II. Mechanism of the Diels-Alder Reaction.

Norman David Malmuth (Aeronautics). *B.A.E., University of Cincinnati, 1950; M.A.E., Polytechnic Institute of Brooklyn, 1956.*

- Thesis: Perturbations on Hypersonic Wedge Flow.

Gary Lynn Marlotte (Aeronautics and Physics). *B.S.A.E., Purdue University, 1958; M.S., California Institute of Technology, 1959.*

- Thesis: An Experimental Investigation of the Effect of a Transverse Flow Velocity upon a Low-Density D.C. Electrical Discharge in Air.

Gerald A. Marxman (Mechanical Engineering and Physics). *B.A., Case Institute of Technology, 1956.*

- Thesis: Heat Transfer in Reacting Gas Mixtures with Large Pressure Gradients.

Peter Vroman Mason (Electrical Engineering and Physics). *B.S., California Institute of Technology, 1951; M.S., 1952.*

- Thesis: Surface Impedance of Thin Superconducting Films.

John Francis McCarthy, Jr. (Aeronautics and Physics). *S.B., Massachusetts Institute of Technology, 1950; S.M., 1951.*

- Thesis: Hypersonic Wakes.

DOCTOR OF PHILOSOPHY—*continued*

James Arthur McCray (Physics). *A.B., Millikin University, 1954; M.S., Agricultural and Mechanical College of Texas, 1955.*

Thesis: The Elastic Scattering of Protons from Li^6 Nuclei.

Martin Mendelson (Animal Physiology and Geobiology). *A.B., Cornell University, 1958.*

Thesis: Studies on the Activation of Crustacean Mechanoreceptors. The Movement Receptors of the Crab *Pachygrapsus crassipes* Randall and the Movement and Stretch Receptors of the Crayfish *Procambarus clarkii* (Girard).

Roger Edwin Messick (Engineering Science). *B.S., University of Illinois, 1951; M.S., 1952.*

Thesis: Applications of an Edge-and Corner Layer Technique to Elastic Plates and Shells.

F. Curtis Michel (Physics). *B.S., California Institute of Technology, 1955.*

Thesis: The Beta Spectra of the Mass 12 Nuclei.

Hugh Thompson Millard, Jr. (Chemistry). *B.A., Coe College, 1957.*

Thesis: I. A Procedure for the Analysis of Polonium-210 and Lead-210 in Rocks.
II. A Characterization of the Meteorite Flux at the Earth's Orbit.

Charles Robert Miller (Physics and Mathematics). *B.S., California Institute of Technology, 1953.*

Thesis: The Orientation of Dust Grains in Interstellar Space.

Richard Stephen Muller (Electrical Engineering and Physics). *M.E., Stevens Institute of Technology, 1955; M.S., California Institute of Technology, 1957.*

Thesis: Electronic Processes in Au-CdS-In Diodes.

Gerald Leslie Pollock (Physics and Mathematics). *B.S., Brooklyn College, 1954; M.S., California Institute of Technology, 1957.*

Thesis: Heat Flow in Liquid Helium with Clamped Normal Fluid.

R. Darden Powers (Physics). *B.S., University of Oklahoma, 1955; M.S. California Institute of Technology, 1957.*

Thesis: The Range of Heavy Ions in Solid Materials.

Richard Bradley Read (Physics). *B.S., California Institute of Technology, 1957.*

Thesis: Accurate Declination Measurements of Radio Sources.

Robert Leopold Rosenfeld (Applied Mechanics). *S.B., Massachusetts Institute of Technology, 1959.*

Thesis: Analysis of Long Compressional Elastic Waves in Rods of Arbitrary Cross Section and Elastic Wave Fronts in Plates and Circular Rods.

DOCTOR OF PHILOSOPHY—*continued*

Henry Ruderman (Physics). *B.S., Rennselaer Polytechnic Institute, 1956.*

Thesis: Photoproduction of Neutral Pions from Complex Nuclei: An Indirect Measurement of the π^0 Lifetime.

Richard Allan Schapery (Aeronautics). *B.S., Wayne State University, 1957; M.S., California Institute of Technology, 1958.*

Thesis: Irreversible Thermodynamics and Variational Principles with Applications to Viscoelasticity.

Edward Joseph Seppi (Physics). *B.S., Brigham Young University, 1952; M.S., University of Idaho, 1956.*

Thesis: Nuclear-Resonance Excitation in F^{19} and Mn^{55} with a Germanium Bent-Crystal Monochromator.

Fred Ichiro Shimabukuro (Electrical Engineering and Physics). *S.B., Massachusetts Institute of Technology, 1956; S.M., 1956.*

Thesis: A Study of Dispersion in Plasmas.

Donald Cecil Shreffler (Genetics and Chemistry). *B.S., University of Illinois, 1954; M.S., 1958.*

Thesis: I. Genetic Studies of Mouse Serum Protein Types.
II. Molecular Hybridization of Sheep Hemoglobins.

John Richard Stevens (Physics). *B.A., Pomona College, 1956; M.S., California Institute of Technology, 1959.*

Thesis: A Study of the Alpha-Particle Decay from Certain Excited Levels in C^{12} , O^{16} , and Ne^{20} Following Population of the Levels by Beta-Decay.

Jack Justin Stiffler (Electrical Engineering). *B.A., Harvard College, 1956; M.S., California Institute of Technology, 1957.*

Thesis: Self-Synchronizing Binary Telemetry Codes.

Edwin Jule Stofel (Mechanical Engineering and Physics). *B.S., California Institute of Technology, 1953; M.S., 1954.*

Thesis: Plastic Flow and Fracture of Zinc Single Crystals.

Millard Susman (Genetics and Biochemistry). *A.B., Washington University, 1956.*

Thesis: The Size of the Mating Group in Bacteriophage T4.

Colwyn Boyd Trevarthen (Psychobiology). *B.Sc., University of New Zealand, 1952; M.Sc., 1954.*

Thesis: Studies on Visual Learning in Split-Brain Monkeys.

DOCTOR OF PHILOSOPHY—*continued*

Emilio Cesare Venezian (Chemical Engineering). *B.Eng., McGill University, 1958; M.S., California Institute of Technology, 1959.*

Thesis: I. Temperature Gradients in Turbulent Gas Streams, Effect of Viscous Dissipation on the Evaluation of Total Conductivity.

II. Thermal Transfer from Small Wires in the Boundary Flow about a Cylinder.

William Gerard Wagner (Physics). *B.S., California Institute of Technology, 1958.*

Thesis: Production and Decay Processes Involving Vector Mesons.

Duen-pao Wang (Engineering Science). *B.S., National Taiwan University, 1956; M.S., Virginia Polytechnic Institute, 1958.*

Thesis: A Perturbation Theory for Unsteady Cavity Flows.

Neng-Ming Wang (Engineering Science). *B.S., National Taiwan University, 1955; M.S., University of Texas, 1958.*

Thesis: Bending of Thin Elastic Plates Containing Line Discontinuities.

Robert LeRoy Wildey (Astronomy). *B.S., California Institute of Technology, 1957; M.S., 1958.*

Thesis: The Stellar Content of the Perseus Galactic Arm in the Region of η and χ Persei.

Robert Woodrow Wilson (Physics). *B.A., Rice University, 1957.*

Thesis: Observations of the Galactic Plane at 960 Megacycles per Second.

Daniel Lewis Wulff (Chemistry). *B.S., California Institute of Technology, 1958.*

Thesis: On Nucleic Acid Photochemistry.

Cavour Wei-Hou Yeh (Electrical Engineering). *B.S., California Institute of Technology, 1957; M.S., 1958.*

Thesis: Electromagnetic Surface-wave Propagation along a Dielectric Cylinder of Elliptical Cross Section.

Harold Thomas Yura (Physics). *B.S., California Institute of Technology, 1959.*

Thesis: The Quantum Electrodynamics of a Medium.

Abraham Zukerman (Aeronautics and Mathematics). *B.S., St. Louis University, 1954; M.S., University of Southern California, 1956; M.S., California Institute of Technology, 1958.*

Thesis: Analytical Approximations to the Solutions of the Equations of Motion in the Earth Moon Space.

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