

## Harvard Physics PhD Theses, 1954-1970

### 1954

BENEDEK, GEORGE BERNARD, S.B. (Rensselaer Polytechnic Institute) 1949, A.M. (Harvard University) 1951. Nuclear Magnetic Resonance in Liquids under High Pressure.

CHEN, FRANCIS FENG-HSIANG, A.B. (Harvard University) 1950, A.M. (Harvard University) 1951. The Interaction of 870 Mev Protons with Nuclei.

CORNGOLD, NOEL ROBERT, A.B. (Columbia University) 1949, A.M. (Harvard University) 1950. A Measurement of the Magnetic Moment of the Neutron.

FULTON, THOMAS, A.B. (Harvard University) 1950, A.M. (Harvard University) 1951. Energy levels of Positronium.

GORDON, GARY DONALD, A.B. (Wesleyan University) 1950, A.M. (Harvard University) 1951. Protons in Cosmic Rays.

HILLMAN, PETER, A.B. (Harvard University) 1948 (1949), A.M. (Harvard University) 1950. Total Cross Sections of Liquefied Gases for High Energy Neutrons.

MARTIN, PAUL CECIL, A.B. (Harvard University) 1952 (1951), A.M. (Harvard University) 1953. Bound State Problems in Electrodynamics.

MILBURN, RICHARD HENRY, A.B. (Harvard University) 1948, A.M. (Harvard University) 1951. The Measurement of Short Time Intervals in the Study of Rare Elementary Particles.

NEWTON, ROGER GERHARD, A.B. (Harvard University) 1949, A.M. (Harvard University) 1950. Radiative Corrections to Coulomb Scattering.

SMITH, STEPHEN JUDSON, A.B. (Kalamazoo College) 1949, A.M. (Harvard University) 1950. Visible Light from Localized Surface Charges Moving Across a Grating.

STAHL, RALPH HENRY, A.B. (Harvard University) 1950 (1949), A.M. (Harvard University) 1950. Neutron-Proton Scattering at 91 Mev.

STEWART, JOHN WESTCOTT, A.B. (Princeton University) 1949, A.M. (Harvard University) 1950. Some Measurements at High Pressure and Low Temperature.

TEEM, JOHN McCORKLE, A.B. (Harvard University) 1950 (1949), A.M. (Harvard University) 1951. Elastic Scattering of 95 Mev Protons by Deuterons.

TOWNE, DUDLEY HERBERT, S.B. (Yale University) 1947, A.M. (Harvard University) 1949. The Line Shape of Scattered Radiation.

YOUNG, LEE ADAMS, A.B. (Yale University) 1949, A.M. (Harvard University) 1950. Diffusion Cloud Chamber Study of Interactions of 85 Mev Neutrons in Nitrogen.

## 1955

BERNSTEIN, JEREMY, A.B. (Harvard University) 1951, A.M. (Harvard University) 1953. Electromagnetic Properties of the Deuteron.

BUTLER, DANIEL KNOWLES, A.B. (Harvard University) 1950, A.M. (Harvard University) 1952. Yields of Mercury Isotopes from Proton Bombardment of Gold.

CHANG, HOWARD HOW CHUNG, S.B. (California Institute of Technology) 1944, A.M. (University of California) 1949. Diffraction of Electromagnetic Waves by an Aperture in an Infinite Plane Conducting Screen.

HADLEY, GEORGE FRANCIS, S.B. in Chem. Engin. (Carnegie Institute of Technology) 1952, A.M. (Harvard University) 1954. A Theoretical Study of the Hyperfine Structure in the Microwave Inversion Spectra of the Deutero-Ammonias.

HAM, FRANK SLAGLE, A.B. (Harvard University) 1950, A.M. (Harvard University) 1951. Electronic Energy Bands in Metals.

HENDERSON, RALPH STERLING, A.B. (College of Wooster) 1936, A.M. (Harvard University) 1941. Spin Coupling in Polyatomic Molecules.

JOHNSON, KENNETH ALAN, S.B. (Illinois Institute of Technology) 1952, A.M. (Harvard University) 1954. Quantum Electrodynamics of the Scalar Field.

KRUSE, ULRICH ERNST, A.B. (Harvard University) 1950. Proton-Proton Scattering from 40 to 95 Mev.

LUDWIG, GERALD WILBUR, A.B. (Harvard University) 1950, A.M. (Harvard University) 1951. Ultra-High Frequency Nuclear Quadrupole Spectra.

McCORMICK, BRUCE HOWARD, S.B. (Massachusetts Institute of Technology) 1950. Two Investigations in Meson Theory in the Nonrelativistic Limit.

NIEMANN, FREDERICK LEHR, S.B. (State College of Washington) 1940, S.M. (ibid.) 1946, A.M. (Harvard University) 1947. The Energy Spectrum of Pi-Mesons Produced by 2.2 Bev Protons in Beryllium.

PEASLEE, ALFRED TREDWAY, JR., A.B. (Harvard University) 1952, A.M. (Harvard University) 1953. Electrodynamical Modes of Isomeric Decay.

RAPHAEL, ROBERT BARNETT, S.B. (Rensselaer Polytechnic Institute) 1950, A.M. (Harvard University) 1953. Phenomenological Methods in Nucleon-Nucleon Scattering.

SHAPIRO, IRWIN IRA, A.B. (Cornell University) 1950, A.M. (Harvard University) 1951. Methods of Approximation for High Energy Nuclear Scattering.

TITUS, WALTER FRANKLIN, A.B. (Amherst College) 1948, A.M. (Harvard University) 1950. The Scattering of 96 Mev Protons from Several Nuclei.

WERTHEIM, GUNTHER KLAUS, M.E. (Stevens Institute of Technology) 1951, A.M. (Harvard University) 1952. On Gamma Ray Directional Correlations Disturbed by Extra-Nuclear Fields.

ZEMACH, ARIEL CHARLES, A.B. (Harvard University) 1951, A.M. (Harvard University) 1953. I. Neutron Diffraction. II. Size of the Proton Magnetization.

## **1956**

BAILYN, MARTIN HILLEL, A.B. (Williams College) 1948, A.M. (Harvard University) 1953. The Conductivity of the Alkali Metals.

CARLETON, NATHANIEL PHILLIPS, A.B. (Harvard University) 1951, A.M. (Harvard University) 1952. Excitation of Light by Hydrogen Ions.

FLETCHER, NEVILLE HORNER, B.Sc. (University of Sydney) 1952, A.M. (Harvard University) 1953. I. Impurity Levels in Semiconductors. II. A Self-Bias Effect in Power Transistors.

LEWIS, HENRY RAFALSKY, A.B. (Harvard University) 1949 (1948), A.M. (Harvard University) 1949. Distortions in Molecular Beam Resonances.

SILSBEE, ROBERT HERMAN, A.B. (Harvard University) 1950, A.M. (Harvard University) 1951. Experimental Determination of the Cross Section for Optical Absorption by F-Centers in KCl and NaCl.

## **1957**

BILLS, DANIEL GRANVILLE, S.B. (State College of Washington) 1949, S.M. (ibid.) 1951. Adsorption of Activated Gases.

CODY, GEORGE DEWEY, A.B. (Harvard University) 1952, A.M. (Harvard University) 1954. Volume Changes Associated with the Superconducting Transition.

CULLER, VAUGHN EDGAR, A.B. (West Virginia University) 1949, S.M. (ibid.) 1949. Gamma-Ray Spectra from Elements Bombarded by 24 to 107 Mev Protons.

FISHMAN, FRANK JOHN, JR., S.B. (University of Illinois) 1952, A.M. (Harvard University) 1953. A Kinetic Approach to Neutral and Ionized Gas Dynamics.

HOOVER, JAMES RIPLEY, JR., A.B. (Harvard University) 1937 (1938), S.M. (Harvard University) 1939. Cavity Mode Coupling by an Electronic Space-Charge in a Magnetic Field.

HORWITZ, LAWRENCE PAUL, S.B. (New York University) 1952, A.M. (Harvard University) 1954. Low Energy Applications of Meson Field Theory.

KETUDAT, SIPPANONDHA, S.B. (University of California) 1953, A.M. (Harvard University) 1954. Electric Quadrupole Interactions of Deutrons in Deuterated Crystals.

KIVELSON, MARGARET GALLAND (R), A.B. (Radcliffe College) 1950, A.M. (ibid.) 1951. Bremsstrahlung of High Energy Electrons.

NOXON, JOHN FRANKLIN, 3D, A.B. (Bowdoin College) 1950, A.M. (Harvard University) 1951. Active Nitrogen at High Pressure.

QUINN, WARREN EUGENE, S.B. (State College of Washington) 1951, S.M. (ibid.) 1952. Radio-Frequency Spectroscopy of HD.

ROTH, LAURA MAURER (R), B.A. (Swarthmore College) 1952, a.m. (Radcliffe College) 1953. The Scattering of Conduction Electrons by Impurities in Metals.

SOMMERFIELD, CHARLES MICHAEL, S.B. (Brooklyn College) 1953, A.M. (Harvard University) 1954. The Theory of the Magnetic Dipole Moment of the Electron.

WRIGHT, WILLIAM ROBERT, A.B. (Harvard University) 1951, A.M. (Harvard University) 1952. Nuclear Orientation in Paramagnetic Crystals.

## **1958**

ALBERTSON, JAMES STANISLAUS, A.B. (St. Louis University) 1952, A.M. (ibid.) 1953, A.M. (Harvard University) 1955. High Energy Scattering and Polarization of Nucleons and Deuterons.

BAKER, MARSHALL, A.B. (Harvard University) 1953. Determinantal Methods Applied to Meson-Nucleon Collisions.

CARPENTER, STUART GORDON, S.B. (University of Kentucky) 1953, A.M. (Harvard University) 1956. Search for Neutron Resonances at 100 Mev and P-N Asymmetries at 143 Mev.

COOPER, PAUL FENIMORE, JR., A.B. (Harvard University) 1952, A.M. (Harvard University) 1953. Cross Sections and Asymmetries of Pickup Deuterons at 145 Mev.

CULVAHOUSE, JACKIE WAYNE, S.B. (University of Oklahoma) 1951, A.M. (Harvard University) 1954. Dynamic Orientation of  $AS^{76}$  Nuclei.

FOX, RAYMOND, S.B. (College of the City of New York) 1953, A.M. (Harvard University) 1955. Angular and Energy Distributions of Low Energy Protons from Targets Bombarded by High Energy Protons.

GERSTEIN, GEORGE LEONARD, A.B. (Harvard University) 1952, A.M. (Harvard University) 1954. The Elastic Scattering of 160 Mev Protons by Nuclei of Adjacent Mass.

HUBBARD, PAUL STANCYL, JR., S.B. (University of Florida) 1953, A.M. (Harvard University) 1954. Nuclear Magnetic Relaxation: Density Operator Theory and its Application to Three and Four Spin Molecules in a Liquid; Experimental Study of Methane.

KLEITMAN, DANIEL J., A.B. (Cornell University) 1954, A.M. (Harvard University) 1955. Static Properties of Heavy Fermi Particles; Deuteron Nucleon Scattering at High Energies.

LA TOURRETTE, JAMES THOMAS, S.B. (California Institute of Technology) 1953, A.M. (Harvard University) 1954. The Magnetic Moment of  $Ne^{21}$ .

PYTTE, AGNAR, A.B. (Princeton University.) 1953, A.M. (Harvard University) 1954. Internal Bremsstrahlung in  $\beta$  Decay.

RICE, MICHAEL WALTER, A.B. (DePauw University) 1950, A.M. (Harvard University) 1952. Nuclear Magnetic Relaxation Effects of Ions in Solution.

SAWYER, RAYMOND FRANCIS, A.B. (Swarthmore College) 1953, A.M. (Harvard University) 1955. K Meson and Hyperon Decays.

SCHWARTZ, JACK, S.B. (College of the City of New York) 1953, A.M. (Harvard University) 1954. Nuclear Magnetic Relaxation in Sulfur Hexafluoride Near the Critical Point.

TAYLOR, EDWIN FLORIMAN, A.B. (Oberlin College) 1953, A.M. (Harvard University) 1954. Nuclear Spin Saturation by Ultrasonics in Sodium Chloride.

WALSH, WALTER MICHAEL, JR., A.B. (Harvard University) 1954, A.M. (Harvard University) 1955. The Dependence of Crystalline Field Splittings on Lattice Parameters.

WARNER, CHARLES, 3D, A.B. (Princeton University) 1953, A.M. (Harvard University) 1954. Associated Production and Strong Interactions.

WEITZNER, HAROLD, A.B. (University of California) 1954, A.M. (Harvard University.) 1955. Hyperon-Nucleon Interactions.

## 1959

EMERY, GUY TRASK, A.B. (Bowdoin College) 1953, A.M. (Harvard University) 1954. Nuclear Spectra of the Thorium Active Deposit.

ERWIN, ALBERT RICH, JR., S.B. (Duke University) 1953, A.M. (Harvard University) 1955.  $\Sigma^+ - K^+$  Production in 990 Mev  $\pi^+ - p$  Collisions.

FALK, DAVID S., B.E. (Cornell University) 1954, A.M. (Harvard University) 1955. Approximation Methods in the Theory of Green's Functions.

FAVRO, LAWRENCE DALE, A.B. (Harvard University) 1954, A.M. (Harvard University) 1955. The Theory of Rotational Brownian Motion.

GLASHOW, SHELDON LEE, A.B. (Cornell University) 1954, A.M. (Harvard University) 1955. The Vector Meson in Elementary Particle Decays.

KANE, WALTER REILLY, S.B. (Stanford University.) 1949, S.M. (University of Washington) 1951. Photoelectric and Internal Conversion Spectra of Neutron-Deficient Iridium Isotopes.

KLEPPNER, DANIEL, A.B. (Williams College) 1953, B.A. (University of Cambridge) 1955. The Broken Atomic Beam Resonance Experiment.

KOLENKOW, ROBERT JOHN, S.B. (Massachusetts Institute of Technology) 1955, A.M. (Harvard University) 1957. Radio-Frequency Spectrum of Lithium Hydride.

MARR, ROBERT BRUCE, S.B. (Massachusetts Institute of Technology) 1953, A.M. (Harvard University) 1955. Radiative Capture of Orbital Electrons.

NARCISI, ROCCO SANDY, S.B. (Pennsylvania State College) 1953, A.M. (Harvard University) 1955. The Radioactivity of  $Sb^{125}$  and  $Te^{125M}$ .

ORROK, GEORGE TIMOTHY, A.B. (Harvard University) 1952, A.M. (Harvard University) 1953. Dendritic Solidification of Metals.

PALMIERI, JOSEPH NICHOLAS, S.B. (Brown University) 1954, A.M. (Harvard University) 1955. Polarized Proton-Proton Scattering at Energies of 46 to 147 Mev.

POSTMA, HERMAN, S.B. (Duke University) 1955, A.M. (Harvard University) 1957. The Elastic Scattering of 146 Mev Polarized Protons by Deuterons.

ROBINSON, ALLAN RICHARD, A.B. (Harvard University) 1954, A.M. (Harvard University) 1956. Thermal Convection in Rotating Systems.

WARD, ROBERT THEODORE, A.B. (Amherst College) 1953, A.M. (Harvard University) 1954. The Neutral Pions Produced by 3 Bev Protons on Hydrogen.

WARNOCK, ROBERT LEE, A.B. (Reed College) 1952, A.M. (Harvard University) 1955. Approximation Methods in the Theory of Strong Interactions.

## 1960

ANDERSON, LOUIS WILMER, JR., A.B. (Rice Institute) 1956, A.M. (Harvard University) 1957. I.  $N^{14}$ - $N^{15}$  Hyperfine Anomaly. II. The Hyperfine Structures of Atomic  $H^1$ ,  $H^2$ , and  $H^3$ .

BAKER, MILTON ROBERT, A.B. (Harvard University) 1953, A.M. (Harvard University) 1955. Nuclear Magnetic Interactions in Hydrogen Fluoride.

BAYM, GORDON ALAN, A.B. (Cornell University) 1956, A.M. (Harvard University) 1957. Field-Theoretic Approach to the Properties of the Solid State.

BLUME, MARTIN, A.B. (Princeton University) 1954, A.M. (Harvard University) 1956. Energy Bands and Elastic Constants of Solids.

CALAME, GERALD PAUL, A.B. (College of Wooster) 1953, A.M. (Harvard University) 1955. A Derivation of Multi-Group Equations from a Variational Principle.

FURTH, HAROLD PAUL, A.B. (Harvard University) 1951. Magnetic Analysis of  $K^-$  Interactions in Emulsion Nuclei.

GOLDSTEIN, RUBIN, A.B. (Princeton University) 1955, A.M. (Harvard University) 1956. Theory of Resonance Absorption of Neutrons.

HOBBIE, RUSSELL KLYVER, S.B. (Massachusetts Institute of Technology) 1956, A.M. (Harvard University) 1957. The Scattering of Polarized Neutrons by Protons at 128 Mev.

HWANG, CHESTER FAY, S.B. in Mech. Engin. (Duke University) 1952, A.M. (ibid.) 1956. The Depolarization in Proton-Proton Scattering at 142 Mev.

KADANOFF, LEO PHILIP, A.B. (Harvard University) 1957, A.M. (Harvard University) 1958. Theory of Many-Particle Systems: Superconductivity and the Acceleration of a Charged Particle by a Quantized Electric Field.

KUCKES, ARTHUR FRANK, S.B. (Massachusetts Institute of Technology) 1953. The Quasi-Elastic PP and PN Scattering of 145 Mev Protons in Deuterium.

LEAVITT, JOHN ADAMS, A.B. (University of Colorado) 1954, A.M. (Harvard University) 1956. The Spin-Rotational Constant of Hydrogen in Hydrogen Chloride.

McCUMBER, DEAN EVERETT, B.E. (Yale University) 1952, M.E. (ibid.) 1955, A.M. (Harvard University) 1956. Quantum Studies in Boson Systems.

NELSON, HOMER MARK, S.B. (Brigham Young University) 1953, S.M. (ibid.) 1954. The Spin-Rotational Interaction of Fluorine in DF.

NIEDERER, JAMES ALLAN, A.B. (Ripon College) 1953, A.M. (Harvard University) 1955. Pion Proton Charge Exchange Scattering at 950 Mev.

PERSHAN, PETER SILAS, S.B. (Polytechnic Institute of Brooklyn) 1956, A.M. (Harvard University) 1957. Cross Relaxation in Lithium Fluoride.

PUFF, ROBERT DAVID, A.B. (Washington University) 1954, A.M. (Harvard University) 1956. Ground State Properties of Nuclear Matter.

SCOTT, THOMAS A., A.B. (University of Pennsylvania) 1952, A.M. (Harvard University) 1953. Quadrupole Resonance of  $N^{14}$  in Nitrogen and in Clathrates at Low Temperatures.

SIMPSON, ROBERT EDMUND, S.B. (University of Rochester) 1955, A.M. (Harvard University) 1956. A Measurement of the Beta Decay Matrix Elements of  $As^{76}$  and  $Sb^{122}$ .

THORNDIKE, EDWARD HARMON, A.B. (Wesleyan University) 1956, S.M. (Stanford University) 1957. Proton-Proton Triple Scattering: Depolarization at 98Mev, and Rotation at 140 Mev.

## 1961

ASHBY, NEIL, A.B. (University of Colorado) 1955, A.M. (Harvard University) 1956. Applications of Field Theory to Electrical Conductivity.

BAHCALL, JOHN NORRIS, A.B. (University of California) 1956, S.M. (University of Chicago) 1957. Relativistic Corrections in Many-Electron Atoms.

BROWN, LOWELL SEVERT, A.B. (University of California) 1956, A.M. (Harvard University) 1958. Field Theory of Unstable Fermions and Quantum Electrodynamics with an Intrinsic Magnetic Moment.



ENGLESBERG, STANLEY JAY, S.B. (Massachusetts Institute of Technology) 1955, A.M. (Harvard University) 1957. Energy Losses of Fast Particles: Collective Excitations.

EVERETT, ALLEN EDWARD, A.B. (Princeton University) 1955, A.M. (Harvard University) 1956. The Impulse Approximation and Inelastic Proton-Deuteron Scattering.

FEDERIGHI, FRANCIS DeLAGE, A.B. (Oberlin College) 1953, A.M. (Harvard University) 1955. Variational Methods in Nuclear Reactor Physics.

FLORANCE, EDWIN TRENT, A.B. (Amherst College) 1955, A.M. (Harvard University) 1956. Particle Correlations in an Ionized Gas.

GOLDENBERG, HAROLD MARK, S.B. (California Institute of Technology) 1956, A.M. (Harvard University) 1957. The Atomic Hydrogen Maser.

GOLOSIE, RAYMOND, S.B. (Brown University) 1953, A.M. (Harvard University) 1955. The Measurement of Proton Inelastic Cross Sections Between 77 Mev and 133 Mev.

HORRIGAN, FRANK ANTHONY, S.B. (Fordham University) 1954, A.M. (Harvard University) 1955. Time-Dependent Correlations in a Gas of Hard Sphere Molecules.

IRVINE, WILLIAM MICHAEL, A.B. (Pomona College) 1957, A.M. (Harvard University) 1958. Local Irregularities in a Universe Satisfying the Cosmological Principle.

LAWRENCE, THOMAS ROBERT, S.B. (Antioch College) 1954, A.M. (Harvard University) 1956. Rotational Magnetic Moments of Lithium Hydride and Lithium Deuteride.

MAHANTHAPPA, KALYANA THIPPERUDRAIAH, B.Sc. (University of Mysore) 1954, M.Sc. (University of Delhi) 1956. Multiple Production of Bosons in Quantum Field Theory.

MALLIARIS, ATHANASIOS C., B.Sc. (University of Athens), 1953, A.M. (Harvard University) 1958. Alteration of the Decay Constant of Te (125m).

MERMIN, NATHANIEL DAVID, A.B. 1956, A.M. 1957. Thermodynamic Correlation Functions and the Gas-Liquid Transition.

REBKA, GLEN ANDERSON, JR., A.B. (Harvard University) 1953, A.M. (Harvard University) 1954. Gravitational Shift of Frequency.

REYNOLDS, JOHN CHARLES, S.B. (Purdue University) 1956, A.M. (Harvard University) 1957. Surface Properties of Nuclear Matter.

SHAKIN, CARL MARX, S.B. (New York University) 1955, A.M. (Harvard University) 1957. Theory of the Energy Levels of Even-Even Nuclei.

## 1962

ABRAHAM, BARBARA WAYNE (R), B.A. (University of Colorado) 1956, A.M. (Radcliffe College) 1957. I. Propagation of Waves in a Plasma of Variable Density. II. Dynamic Effects of Two-Particle Correlations in a Plasma.

ANDERSON, CHARLES HAMMOND, S.B. (California Institute of Technology) 1957, A.M. (Harvard University) 1961. The Radio-Frequency Spectra of a Group of Simple Hydrocarbons and Their Deuterated Forms.

AVRETT, EUGEN HINTON, S.B. (Georgia Institute of Technology) 1957. Solutions of the Equation of Radiative Transfer.

BOULWARE, DAVID GEORGE, A.B. (University of California) 1958, A.M. (Harvard Univ.) 1960. Aspects of the Foundations of Quantum Electrodynamics.

FJELSTAD, PAUL TIMOTHY, A.B. (St. Olaf Coll.) 1951, A.M. (Harvard University) 1952. The Cesium Beam Storage Box.

GOTTSCHALK, BERNARD, S.B. (Rensselaer Polytechnic Institute) 1955, A.M. (Harvard Univ.) 1957. Quasi-Electric Proton-Proton Scattering in Light Nuclei.

HOFFMAN, RICHARD ALBERT, S.B. (Union College) 1954, A.M. (Harvard University) 1956. The Measurement of the Triple Scattering Parameter A for Elastic and Quasi-Free Events of 137-1/2 Mev Protons on Deuterium.

HOHENBERG, PIERRE CLAUDE, A.B. (Harvard University) 1956, A.M. (Harvard University) 1958. Excitations in a Dilute Condensed Bose Gas.

HOWARD, WEBSTER EUGENE, JR., S.B. (Carnegie Institute of Technology) 1955, A.M. (Harvard University) 1956. Pressure Dependence of Magneto-conductance in n-Type Germanium.

JOSEPH, RICHARD ISAAC, S.B. (City College of New York) 1957. The Magnetic Behavior of Iron Ammonium Alum; The Instability of Magnetostatic Modes.

MINEHART, RALPH CONRAD, S.B. (Yale University) 1956, A.M. (Harvard University) 1957. A Scintillation Bubble Chamber and Its Applications as an Analyzer of Neutron Polarization.

MORELAND, PARKER ELBERT, JR., S.B. (Baylor University) 1954, A.M. (Harvard University) 1955. The  $H^3 - He^3$  Mass Difference.

MUSHER, JEREMY ISRAEL, A.B. (Harvard University) 1957, A.M. (Harvard University) 1961. Studies in High-Resolution Nuclear Magnetic Resonance.

PATEL, POTATLAL MULJIBHAI, B.Sc. (University of Manchester) 1955, M.Sc. (ibid.) 1956. Triple Scattering Parameter  $D_t$  for the Neutron-Proton Interaction.

PINKERTON, JAMES NILES, S.B. (California Institute of Technology) 1954. Nuclear Interactions in Hydrogen Halides.

RONAT, ELHANAN EDWARD, S.B. (Massachusetts Institute of Technology) 1956, A.M. (Harvard University) 1958. The Neutral Decay Model of the  $K_1$  Meson.

SLOAN, EARL LAW, 3D, S.B. (University of Illinois) 1953, A.M. (Harvard University) 1955. Applications of the Superregenerative Detector to the Zero Field Quadrupole Resonance of  $Hg^{201}$  and the Nuclear Magnetic Resonance of Sb in the Fe Hyperfine Field.

STAIRS, DOUGLAS GRANT, B.Sc. (Queen's University) 1955, M.Sc. (ibid.) 1957. Slightly Inelastic Proton-Deuteron Scattering at 158 Mev.

STEINBERG, DANIEL JEREMY, A.B. (Johns Hopkins University) 1955, A.M. (Harvard University) 1957. Small-Angle Polarizations and Cross Sections at 146 Mev.

SZYMANSKI, JOSEPH JAMES, S.B. (Providence College) 1956, A.M. (Harvard University) 1957. A Study of the Interaction  $\pi^- + P \rightarrow \pi^0 + P + \pi^-$  at 975 Mev in a Methyl Iodide Bubble Chamber.

## 1963

ASHKIN, MARTIN, B. Mech. Engin. (Polytechnic Institute of Brooklyn) 1952, A.M. (Harvard University) 1959. Some Magnetic Properties of Systems of Fermions.

AVERELL, JOHN PHILIP, A.B. (Wheaton College) 1956, A.M. (Harvard University) 1957. The Neutral-Mode Branching Ratio of the Lambda Hyperon.

BAKSHI, PRADIP MANHARLAL, B.Sc. (University of Bombay) 1955, A.M. (Harvard University) 1957. Expectation Value Formalism for Quantum Field Theory and High Energy Processes.

BROOKS, RODNEY AVRAM, S.B. (Univ. of Florida) 1953, A.M. (Harvard Univ.) 1958. Rotational Magnetic Moments of Diatomic Alkalis.

CARROLL, ALAN SAVAGE, A.B. (Oberlin College) 1958, A.M. (Harvard University) 1959. A Measurement of Neutron-Proton Polarization at 126 Mev.

CEDERBERG, JAMES WALTER, A.B. (University of Kansas) 1959, A.M. (Harvard University) 1960. Rotational Magnetic Moments in Linear Molecules.

CONSTANTINIDES, EUSTRATIOS, A.B. (Pomona College) 1955, A.M. (Harvard University) 1957. First Order Atomic Wave Functions.

FETTER, ALEXANDER LEES, A.B. (Williams College) 1958, B.A. (University of Oxford) 1960, A.M. (Harvard University) 1961. Vortices in an Imperfect Bose Gas.

FOX, EVELYN. See KELLER, EVELYN FOX.

HELLER, PETER, S.B. (Massachusetts Institute of Technology) 1955. Nuclear Magnetic Resonance in Manganese Fluoride Near the Critical Temperature.

JOHNSON, ERIC GUNNAR, JR. S.B. (Massachusetts Institute of Technology) 1957, A. M. (Harvard University) 1960. Differential Cross Section for Trident Production.

KELLER, EVELYN FOX, A.B. (Brandeis University) 1957, A.M. (Radcliffe College) 1959. Photoinactivation and Expression of Genetic Information in Bacteriophage Lambda.

LAMBERT, ROBERT HENRY, S.B. (St. Lawrence University) 1952, A.M. (Harvard University) 1954. Hyperfine Structure and Pressure Shifts of Nitrogen and Phosphorus.

NEFF, SAMUEL HOLTON, A.B. (Pomona College) 1957, A.M. (Harvard University) 1958. The Excitation of Light in Ion-Molecule Collisions of 400-2000 eV Energy.

SHARNOFF, MARK, S.B. (University of Rochester) 1957. Magnetic Resonance Studies of Unpaired Atoms in a Matrix of Solid D<sub>2</sub>.

SHOTKIN, LOUIS MARVIN, S.B. (Northeastern University) 1955, S.M. (Harvard University) 1957. Xenon and Temperature Induced Instabilities in a Deflected Slab Reactor.

WEYHMANN, WALTER VICTOR, S.B. (Duke University) 1957, A.M. (Harvard University) 1958. Atomic Color Centers in Inert Gas Matrices.

WORTIS, MICHAEL, A.B. (Harvard University) 1958, A.M. (Harvard University) 1959. Low Temperature Behavior of the Ideal Heisenberg Ferromagnet.

**1964**

BENNETT, HERBERT STANTON, A.B. 1958, S.M. (University of Maryland) 1960. Behavior of the Heisenberg Ferromagnet for Temperatures Near and Above the Transition Point.

BORDNER, CHARLES ALBERT, JR., S.B. (Colorado College) 1959, A.M. (Harvard University) 1960. The Reaction  $\pi^- + p \rightarrow \pi^- + \pi^0 + p$  at 1.15 Bev in a High-Z Bubble Chamber with Hydrogen Target.

COULTER, CLAUDE ALTON, A.B. (Howard College) 1956, S.M. (University of Alabama) 1959, A.M. (Harvard University) 1963. Some Implications of the Requirement of Lorentz Covariance in Local Quantum Field Theories.

CRAMPTON, STUART BIGELOW, A.B. (Williams College) 1958, B.A. (University of Oxford) 1960, A.M. (Harvard University) 1961. Hyperfine and Spin Exchange Experiments with the Atomic Hydrogen Maser.

FORTSON, EDWARD NORVAL, S.B. (Duke University) 1957. The Stark Shift of the Hyperfine Separation in Ground State Atomic Hydrogen.

FRANCO, VICTOR, S.B. in Engin. (New York University) 1958, A.M. (Harvard University) 1959. Deuteron Cross Sections and Stripping Processes at High Energies.

GORDON, ROY GERALD, A.B. (Harvard University) 1961, A.M. (Harvard University) 1963. Intermolecular Forces and Molecular Spectroscopy.

GURALNIK, GERALD STANFORD, S.B. (Massachusetts Institute of Technology) 1958, A.M. (Harvard University) 1959. The Photon as a Symmetry Breaking Solution of Field Theory.

HEE, STANLEY YUN HOON, A.B. (University of Hawaii) 1957, A.M. (Harvard University) 1958. Triple Scattering Near 140 Mev: A in Proton-Proton and Proton-Carbon Scattering and R' in Proton-Proton Scattering.

HESS, JOHN, A.B. (Cornell University) 1955, S.M. (University of Chicago) 1956. Orientation of Antimony Isotopes.

HORING, NORMAN JACOB, S.B. (City College of New York) 1954, A.M. (Harvard University) 1955. Quantum Theory of Electron Gas Plasma Oscillations in a Magnetic Field.

HUBER, DAVID LAWRENCE, A.B. (Princeton University) 1959, A.M. (Harvard University) 1960. Interactions in Paramagnetic Crystals.

INOUE, MICHIKO, B.A. (International Christian University) 1958. Some Effects of Orbit-Lattice Interaction in the Paramagnetic Rare Earth Compounds.

JOLLY, HENRY PAUL, JR., S.B. (Massachusetts Institute of Technology) 1958, A.M. (Harvard University) 1961. A Shell Model Calculation of Inelastic Electron Scattering Cross Sections for Excitation of the Low-Lying States of  $\text{Ca}^{40}$  and  $\text{O}^{16}$ .

LANGE, ROBERT VICTOR, S.B. (California Institute of Technology) 1959, A.M. (Harvard University) 1962. Paramagnetic Impurities and Gapless Superconductivity.

MALAVIYA, BIMAL KUMAR, B.Sc. (Banaras Hindu University) 1954, M.Sc. (ibid.) 1956, A.M. (Harvard University) 1959. Reactivity Studies with Subcritical Systems.

MEHRAN, FARROKH, S.B. (University of California) 1959. Rotational Magnetic Moments of the Alkali-Halide Molecules.

PAPAGIANNIS, MICHAEL DEMETRIUS, Dipl. (National Technical University) 1955, S.M. (University of Virginia) 1960. Natural Ionospheric Directivity and Measurements of Radio-Radiation in Space.

PYTTE, ERLING, A.B. (Princeton University) 1959, A.M. (Harvard University) 1961. Spin Phonon Interactions in a Heisenberg Ferromagnet.

QUELLE, FREDERICK WILLIAM, S.B. (Illinois Institute of Technology) 1955, A.M. (Harvard University) 1957. Energy Bands in Semiconductors.

SOBEL, MICHAEL IVOR, A.B. (Swarthmore College) 1959, A.M. (Harvard University) 1961. Proton-Proton Bremsstrahlung.

SOCOLOW, ROBERT HARRY, A.B. 1959, A.M. 1961. Electromagnetic Self-Energies and Weak Decays in Unitary Symmetry.

VAN ZANDT, LONNIE LEE, JR., S.B. (Lafayette College) 1958, A.M. (Harvard University) 1959. Some Effects of Static Spin Density Waves on Electron Transport.

WEINBERG, ALFRED, S.B. (Purdue University) 1955, A.M. (Harvard University) 1957. A Study of the Interaction  $\pi^- + p \rightarrow \pi^0 + n$  at 960 Mev.

YAO, YORK-PENG EDWARD, S.B. (University of California) 1960, A.M. (Harvard University) 1963. Some Aspects of Quantum Field Theory.

## 1965

ADLER DAVID, S.B. (Rensselaer Polytechnic Institute) 1956, A.M. (Harvard University) 1958. Theory of Semiconductor-to-Metal Transitions.

BALLING, LUDWIG CHRISTIAN, A.B. (Oberlin College) 1960, A.M. (Harvard University) 1961. A Measurement of the Magnetic Moment of the Electron.

BLUMENTHAL, RALPH BERTHOLD, A.B. (Oberlin College) 1959, A.M. (Harvard University) 1960. Wide Angle Electron Pair Production.

CHEN, KAO-WEI WENDELL, S.B. (University of Washington) 1960, A.M. (Harvard University) 1962. I. Electron-proton Scattering at High Momentum Transfers, II. Proton Electromagnetic Form Factors.

COOK, DAVID MARSDEN, S.B. (Rensselaer Polytechnic Institute) 1959. A.M. (Harvard University) 1960. Cyclotron Radiation from Plasmas in Weakly Inhomogeneous Magnetic Fields.

CRAPO, LAWRENCE MARTIN, S.B. (University of California) 1960, A.M. (Harvard University) 1963. Spin-Rotation Interactions in Polyatomic Molecules.

DUNNING, JOHN RAY, JR., (Yale University) 1960, S.M. (ibid.) 1961. On the Electromagnetic Form Factors of the Neutron.

FEDDERS, PETER ALAN, S.B. (Yale University) 1961, A.M. (Harvard University) 1960. Itinerant Antiferromagnetism in Metals.

GILBERT, IRA HERBERT, S.B. (Polytechnic Institute of Brooklyn) 1959, A.M. (Harvard University) 1960. The Statistics of Gravitational Clustering.

GREENEBAUM, BEN. A.B. (Oberlin College) 1959, A.M. (Harvard University) 1961. Nuclear Orientation of Rhenium 186, Gold 199, and Antimony 124.

HALPERN, MARTIN BRENT, S.B. (University of Arizona) 1960, A.M. (Harvard University) 1961. S-Matrix Theory and Higher Order Correlations to Weak Interactions.

HARTE, KENNETH JEREMY, S.B. (Rensselaer Polytechnic Institute) 1958, A.M. (Harvard University) 1960. Spin-Wave Effects in the Magnetization Reversal of a Thin Ferromagnetic Film.

HENDERSHOTT, MYRL CHALMERS, S.B. (University of Wyoming) 1958, A.M. (Harvard University) 1960. Inertial Oscillations of Tidal Period.

KWOK, PHILIP CHI-KUEN, S.B. (Massachusetts Institute of Technology) 1961, A.M. (Harvard University) 1964. Some Properties of Interacting Phonons.

LANZEROTTI, LOUIS JOHN, S.B. (University of Illinois) 1960, A.M. (Harvard University) 1963. Photoproduction of Charged Pion Pairs.

OWENS, JAMES CARL, A.B. (Oberlin College) 1959, A.M. (Harvard University) 1963. Phonon Anharmonicity and Microwave Absorption in Alkali Halide Crystals.

PAPALIOLOS, COSTAS DEMETRIOS, S.B. (Rensselaer Polytechnic Institute) 1953, A.M. (Harvard University) 1960. Excitation of Metastable States of N<sub>2</sub> and CO by Electron Impact.

ROSS, DAVID WARD, S.B. (University of Michigan) 1959, A.M. (Harvard University) 1960. Quantum Theory of the Electromagnetic Properties of Matter; Broadening of Spectral Lines.

RYBICKI, GEORGE BRUNO, S.B. (Carnegie Institute of Technology) 1956, A.M. (Harvard University) 1957. Transfer of Radiation in Stochastic Media.

SANDY, FRANK, S.B. (Rensselaer Polytechnic Institute) 1958, A.M. (Harvard University) 1959. Dielectric Dispersion in Ferroelectric Rochelle Salt.

SHAW, MARION LESLEY, A.B. (Colorado College) 1955, A.M. (Radcliffe College) 1957. Chemisorption of Electronegative Gases on Refractory Metals.

WALKER, RUFUS FLOYD, JR. A.B. 1957. Extranuclear Effects upon the Decay of Cs<sup>133</sup>.

WONG, CHUN WA, S.B. (University of California at Los Angeles) 1959, A.M. (Harvard University) 1960. Some Applications of the Brueckner-Bethe-Goldstone Theory in Nuclear Problems.

## 1966

ABU-SHUMAYS, IBRAHIM KHALIL, B.Sc. (American University of Beirut) 1960. Generating Functions and Transport Theory.

CHAN, LAI-HIM, S.B. (University of Maryland) 1961. Phenomenological Field Theory.

ELTHGROTH, PETER GEORGE, S.B. (California Institute of Technology) 1962, A.M. (Harvard University) 1963. Fluctuations and Correlations in the Expanding Universe.

GOLDMAN, MARTIN VAN, A.B. (Princeton University) 1960, A.M. (Harvard University) 1961. Nonlinear Interaction of Plasmons with Coherent Radiation.

INGERSOLL, ANDREW PERRY, A.B. (Amherst College) 1960, A.M. (Harvard University) 1961. Thermal Convection with Shear at High and Low Rayleigh Numbers.



KESSARIS, NIKITAS DEMETRIOS, A.B. (Emory University) 1952, S.M. (Harvard University) 1953. A Mathematical Study of the Penetration, Scattering, and Absorption of 10 to 20 Mev Electron Beams in Water.

KORENMAN, VICTOR, A.B. (Princeton University) 1958, A.M. (Harvard University) 1959. Nonequilibrium Quantum Statistics: Application to the Laser.

MANDULA, JEFFREY ELLIS, A.B. (Columbia University) 1962, A.M. (Harvard University) 1964. Symmetries of the Relative Quantum Kepler Problem.

MATHUR, BHUPENDRA SWAROOP, B.Sc. (University of Allahabad) 1957, M.Sc. (Ibid.) 1959. Hyperfine Frequency and Phase-Shift Measurements with Tritium and Hydrogen.

MOLLOW, BENJAMIN RICHARD, A.B. (Cornell University) 1960. The Quantum Mechanics of Coupled Oscillators.

MOORE, ELVIN JAMES, B.Sc. (University of Western Australia) 1958, M.Sc. (ibid.) 1959. Quantum Theory of Mobility in Doped Semiconductors.

NEIH, HWA-TUNG, B.Sc. (National Taiwan University) 1957, Selected Topics in the Phenomenological Field Theory of Matter.

OZIER, IRVING, B.A. (University of Toronto) 1960, A.M. (Harvard University) 1961. Nuclear Magnetic Interactions and Rotational Moment of  $F_2$ .

RIX, JOHN ROBERT, S.B. (California Institute of Technology) 1960, A.M. (Harvard University) 1964. Coulomb Wave Scattering Theory and Dispersion Relations.

SEKERKA, ROBERT FLOYD, S.B. (University of Pittsburgh) 1960, A.M. (Harvard University) 1961. The Theory of Magnetic Relaxation in Rare Earth Iron Garnets with Application to Europium Iron Garnet.

SHIN, ERNEST EUN-HO, S.B. (Carnegie Institute of Technology) 1957, A.M. (Harvard University) 1960. Density Matrix Approach to Many-Body Problem and Applications to Magneto-Optical Phenomena in Solids.

SHLAER, WILLIAM JOSEPH, A.B. 1961. Proton Proton Bremsstrahlung at 158 Mev.

SPIEGEL, STANLEY LAWRENCE, S.B. (New York University) 1957, A.M. (Harvard University) 1959. Existence and Structure of Inertial Boundary Currents in a Stratified Ocean.

STRAX, NORMAN, A.B. (Princeton University) 1957, A.M. (Harvard University) 1959. A Measurement of the Triple-scattering Parameter  $A'_t$  for Free Neutron-proton Scattering.

THOMPSON, RICHARD SCOTT, S.B. (California Institute of Technology) 1961, A.M. (Harvard University) 1962. Superconductivity of Thin Films.

## 1967

ALBEN, RICHARD, A.B. 1964, A.M. 1965. Behavior of Ytterbium 3+ Ion on Anomalous Sites in Ytterbium Doped Iron Garnet.

BARONE, STEPHEN ROBERT, S.B. (Polytechnic Institute of New York) 1953, S.M. (ibid.) 1954. Application of Field Theoretic Methods to Some Topics in Quantum Electronics.

BURNHAM, DAVID CHARLES, A.B. (Princeton University) 1961. Cahill Spin Exchange with Trapped Ions.

CAHILL, KEVIN ERIC, S.B. (University of Notre Dame) 1963, A.M. (Harvard University) 1964. Representation Theory and Ensemble Averages.

CHANG, SHAU-JIN, B.Sc. (National Taiwan University), 1959, M.Sc. (National Tsing Hua University) 1961. Selected Topics in the Quantum Field Theory.

CONE ALBERT ALOYSIUS, JR., A.B. (Fordham University) 1959, A.M. (Harvard University) 1961. Some Measurements of Inelastic Electron-Proton Scattering.

CRUZ-VIDAL, BALTASAR AUGUSTO, A.B. 1960, A.M. 1961. F Center Formation at 78°K in KBr During Exposure to Monochromatic X-Ray Energies Around the Bromine K Edge.

FAISSLER, WILLIAM LEE, A.B. (Oberlin College) 1961, A.M. (Harvard University) 1962. High Energy Electron Scattering From Carbon in the Forward Direction.

HODGES, LAURENT, A.B. 1960, A.M. 1961. Interpolation Scheme for Band Structure of Noble and Transition Metals: Ferromagnetism and Neutron Diffraction in Nickel .

HULD, BENT, S.B. (California Institute of Technology) 1961, A.M. (Harvard University) 1962. Radiative Corrections to Pair Production and Bremsstrahlung.

JOSEPH, PETER MARON, S.B. (Lafayette College) 1959, A.M. (Harvard University) 1961. Photoproduction of Charged K and Pi Mesons at High Energy.

KOSICKI, BERNARD BROOKS, A.B. (Wesleyan University) 1961, A.M. (Harvard University) 1962. Effect of Pressure on Optical Absorption, Re-Combination Radiation and Resistivity of GaSb.

KUPFERMAN, STUART LESLIE, S.B. (Polytechnic Institute of Brooklyn) 1959, A.M. (Harvard University) 1964. Properties of Rubidium Atoms Trapped in Solid Argon.

LIEBER, MICHAEL, A.B. (Cornell University) 1957, A.M. (Harvard University) 1958. Application of the Hidden Symmetry Group of the Non-Relativistic Hydrogen Atom.

LYNCH, DAVID DEXTER, S.B. (Tufts University) 1956, A.M. (Harvard University) 1957. Expectation Value Formalism for Many-Particle Systems: Some Transport Coefficients of an Electron Gas in a Magnetic Field.

McCOY, BARRY MALCOLM, S.B. (California Institute of Technology) 1963. Spin Correlations of the Two Dimensional Ising Model.

MYINT, MAUNG THAN, B. Sc. (University of Rangoon) 1960, A.M. (Harvard University) 1963. I.  $\text{He}^3$  Nuclear Zeeman Maser. II. An Absolute Determination of the Electron-Proton g-Factor Ratio.

PARKER, LEONARD EMANUEL, A.B. (University of Rochester) 1960, A.M. (Harvard University) 1962. The Creation of Particles in an Expanding Universe.

SANDERSON, JACK TUCK, A.B., 1958, A.M. 1967. A Dynamically Polarized Proton Target.

STANLEY, HARRY EUGENE, A.B. (Wesleyan University) 1962. Critical Phenomena in Heisenberg Models of Magnetism.

TEAL, JOHN DAVID, S.B. (California Institute of Technology) 1959, A.M. (Harvard University) 1961. Electron Triplet Production by Photons up to 4.5 GeV in a Hydrogen Bubble Chamber.

WEINER, ROBERT ALLEN, A.B. (Columbia University) 1961, A.M. (Harvard University) 1962. Many-Body Effects in Metals.

YI, PON-NYONG, A.B. (Dartmouth College) 1959. The Hyperfine Structure of Free Methane Molecules.

## **1968**

BERTRAM, HAROLD NEAL, A.B. (Reed College) 1963, A.M. (Harvard University) 1964. Magnetoelastic Effects in Europium Iron Garnet.

BOYER, TIMOTHY HOWARD, A.B. (Yale University) 1962, A.M. (Harvard University) 1964. Some Aspects of Quantum Electromagnetic Zero-Point Energy and Retarded Dispersion Forces.

BUDNITZ, ROBERT JAY, A.B. (Yale University) 1961, A.M. (Harvard University) 1962. Quasi-Elastic Electron-Deuteron Scattering.

COOPER, FREDERICK MICHAEL, S.B. (City College of New York) 1964, A.M. (Harvard University) 1966. Photoproduction of Mesons with Linearly Polarized Protons.

DRESS, WILLIAM BENJAMIN JR., S.B. (Antioch College) 1963. An Upper Limit for the Electric Dipole of the Neutron.

FELS, STEPHEN BROOK, A.B. 1961, A.M. 1963. Corrections to the Electromagnetic Mass Sum Rule.

FUREY, WILLIAM NORMAN, JR., A.B. (Rice University) 1962, A.M. (Harvard University) 1963. Band Theory of Spin-Orbit Effects and Ferromagnetic Anisotropy.

GOITEIN, MICHAEL BENEDICT, B.A. (University of Oxford) 1961, A.M. (Harvard University) 1963. Measurements of Elastic Electron-Proton Scattering Cross-Sections by a Coincidence Technique.

GROSSMAN, DAVID DANIEL, A.B. 1961, A.M. 1962. Theory and Operation of Wide Gap Spark Chambers.

HEARN, DAVID RUSSELL, S.B. (California Institute of Technology) 1964, A.M. (Harvard University) 1966. A Search for Celestial Sources of Gamma Rays of Energy Greater than 100 MeV.

HOUK, THEODORE LEWIS, S.B. (University of Washington) 1957, B.A. (University of Oxford) 1959, A.M. (Harvard University) 1962. The Neutron-Proton Total Cross Section.

HUANG, LUC, S.B. (University of California at Berkeley) 1955, A.M. (Harvard University) 1956. Classical and Quantum Theory of Dissipation in Systems of Coupled Oscillators: Brownian Motion and Rate Equations.

KNAESEL, THOMAS MICHAEL, B.E.E. (University of Virginia) 1962, A.M. (Harvard University) 1963. An Accurate Determination of the Total Photon Cross-Section in Carbon, Aluminum, Copper and Lead for Photons of 1.200 to 4.050 GeV.

LANG, NORTON DAVID, A.B. 1962, A.M. 1965. Topics in the Theory of Transition Metals.

MISTRETTA, CHARLES ANTHONY, S.B. (University of Illinois) 1962, A.M. (Harvard University) 1964. Pion Electroproduction Coincidence Measurements Near the First Pion-Nucleon Resonance.

NUSSBAUM, GILBERT HERBERT, S.B. (City College of New York) 1960, A.M. (Harvard University) 1962. Measurement of the Coherence Time of the  $6^3P_1$  State of Mercury by the Method of Decayed Photon Coincidences.

PALMER, PATRICK EDWARD, S.B. (University of Chicago) 1963, A.M. (Harvard University) 1965. Radio Frequency Recombination Spectra of Diffuse Nebulae.

PASS, THEODORE MICHAEL, A.B. (University of Minnesota) 1959, A.M. (Harvard University) 1960. Collision Models in the Kinetic Theory of Gases.

PRITCHARD, DAVID EDWARD, S.B. (California Institute of Technology) 1962, A.M. (Harvard University) 1964. Differential Spin Exchange Scattering: Sodium on Cesium.

RUDNICK, DAVID FRANKLIN, S.B. (Stanford University) 1962, A.M. (Harvard University) 1964. Electromagnetic Pair Production in Hydrogen by Photons of Energy 1.8 GeV. to 4.3 GeV.

SCHIVELL, JOHN FRANCIS, A.B. 1963, A.M. 1964. Photoproduction of Neutral K Mesons.

SNYDER, NANCY SIMON, S.B. (University of Chicago) 1960, A.M. (Harvard University) 1961. Mössbauer Effect in  $\text{Sn}^{119}$  at Low Temperatures.

UZGIRIS, EGIDIJUS EDWARD, S.B. (University of Illinois) 1962, A.M. (Harvard University) 1964. Large Storage Box Hydrogen Maser.

VERDIER, ROBIN FIFE, A.B. (Pomona College) 1954, A.M. (Harvard University) 1956. A Partial-Wave Calculation of Inelastic Electron Scattering.

von FOERSTER, THOMAS, S.B. (University of Illinois) 1962, A.M. (Harvard University) 1964. Quantum Theory of the Propagation of Light Through an Amplified Medium.

WEHMANN, ALAN AHLERS, S.B. (Rensselaer Polytechnic Institute) 1962, A.M. (Harvard University) 1963. Pion and Kaon Production of Muon Pairs in Carbon and Iron.

WONG, MERVYN, B.Sc. (University of Canterbury) 1961. A.M. (Harvard University) 1964. Application of a Tagged Photon and Wide-Gap Spark Chamber to a Measurement of Electron Pair Production.

YAN, TUNG-MOW, B.Sc. (National Taiwan University) 1960, M.Sc. (National Tsinghua University) 1962. Selected Topics in Theory of Magnetic Charge and Phenomenological Theory of Particles.

## 1969

APPEL, JEFFREY ALAN, A.B. (Williams College) 1964, A.M. (Harvard University) 1965. Test of Time Reversal Invariance in Inelastic Electron Scattering from a Polarized Proton Target.

BAIRD, JAMES KERN ‡, S.B. (Yale University) 1963, A.M. (Harvard University) 1965. A Search for a Neutron Electric Dipole Moment by the Method of Neutron Beam Magnetic Resonance.

BENDER, CARL MARTIN, A.B. (Cornell University) 1964, A.M. (Harvard University) 1965. The Anharmonic Oscillator.

BRENNER, DOUGLAS, A.B. (John Hopkins University) 1961, A.M. (Harvard University) 1963. Frequency Shifts in a Motional Field-Averaging System and Studies with the Hydrogen Maser.

CARMAN, ROBERT LINCOLN, JR., A.B. (Adelphi University) 1962. Third Order Optical Non-Linearities and the Propagation on Intense Light Beams.

CARROLL, CLARK EDWARD, S.B. (California Institute of Technology) 1959, A.M. (Harvard University) 1965. Propagation of Sound in Liquid Helium II.

CHEN, JAMES RALPH, A.B. (Brandeis University) 1962, A.M. (Harvard University) 1964. Test of Time Reversal Invariance in Electroproduction Interactions using a Polarized Proton Target.

EISENSTEIN, LAURA BEATRICE, A.B. (Columbia University), 1963, A.M. (ibid.) 1964. The Reaction  $K^+p \rightarrow K^+p\pi^+\pi^-$  at 3.2 GeV/c.

FEUER, MICHAEL, A.B. 1964. Parity Violation in Nuclear Processes.

HOFFMAN, CYRUS MILLER, S.B. (Brown University) 1962, A.M. (Harvard University) 1964. High Energy Muon Inelastic Scattering in Carbon.

IOFFREDO, MICHAEL LOUIS, S.B. (Stevens Institute of Technology) 1963, A.M. (Harvard University) 1964. The Reaction  $\pi^-p \rightarrow p\pi^+\pi^-\pi^-$  at 20 BeV/c.

IVANETICH, RICHARD JOHN, S.B. (University of California at Berkeley) 1963. Source Theory and Double-Spectral Forms.

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‡ The Double Dagger indicates that the degree conferred was in Chemical Physics, the work done under the supervision of a member of the Physics Department.

KEFFER, CHARLES JOSEPH, S.B. (University of Scranton) 1963, A.M. (Harvard University) 1964. Semiconductor Band Gaps which Increase with Temperature.

LACINA, WILLIAM BRADLEY, S.B. (Rensselaer Polytechnic Institute) 1962, A.M. (Harvard University) 1963. Phonon Optical Properties of Mixed Fluorite Systems: Raman Scattering from  $\text{Ca}_{1-x}\text{Sr}_x\text{F}_2$  and  $\text{Ba}_{1-x}\text{Sr}_x\text{F}_2$ .

LEFRANÇOIS, JACQUES, B.A. (University of Paris) 1954, B.Sc. (University of Montreal) 1957, A.M. (Harvard University) 1959. The Measurement of the R Parameter for Proton-Deuteron Elastic Scattering and for Quasi-Free Proton-Proton and Proton-Neutron Scattering in Deuterium.

LEVINE, BARRY FRANKLIN, S.B. (Polytechnic Institute of Brooklyn) 1963, A.M. (Harvard University) 1965. Magnetic and Elastic Properties of  $\text{Ga}_{2-x}\text{Fe}_x\text{O}_3$ .

LIBERMAN, ARTHUR DAVID, A.B. (Dartmouth College) 1962, A.M. (Harvard University) 1963. Muon Bremsstrahlung.

LUBENSKY, TOM CARL, S.B. (California Institute of Technology) 1964, A.M. (Harvard University) 1965. Some Aspects of Magnetic Correlations and Linewidths.

LUYTEN, JAMES REINDERT, A.B. (Reed College) 1963. A.M. (Harvard University) 1965. Collision Models and Radiative Equilibrium.

MILDER, DAVID MICHAEL, S.B. (California Institute of Technology) 1959. Rotating Stellar Systems.

RADKOWSKI, ALFRED FRANZ, S.B. (City College of New York) 1961. A.M. (Harvard University) 1962. Some Aspects of Source Description of Gravitation.

RANDOLPH, JOHN KEMP, A.B. (Williams College) 1960. A.M. (Harvard University) 1962. Asymmetric Electron Pair Production.

RIEKE, GEORGE HENRY, A.B. (Oberlin College) 1964. A.M. (Harvard University) 1965. A Search for Cosmic Gamma Rays by Detection of Atmospheric Cerenkov Radiation.

ROSNER, SHELDON DAVID, B.Sc., (University of Toronto) 1962, A.M. (Harvard University) 1963. Zero-field Hyperfine Structure of the  $2^3\text{S}_1$  State of  $\text{He}^3$ .

SAGE, JAY PETER, A.B. 1964, A.M. 1965. The Effect of two-magnon Scattering on Parallel-Pump Instability Thresholds.

SHEI, SUN-SHENG, B.Sc. (National Taiwan University) 1963, A.M. (Harvard University) 1965. Broken Chiral Symmetry.

TENENBAUM, JOEL, S.B. (California Institute of Technology) 1962, A.M. (Harvard University) 1963. Photoproduction of Electron-Positron Pairs at 2.3 and 5.6 GeV.

WALLS, DANIEL FRANK, B.Sc. (University of Auckland) 1964, M.Sc. (ibid.) 1966. Topics in Non-Linear Quantum Optics.

WOLF, CARL ANTON, S.B. (Stevens Institute of Technology) 1963, A.M. (Harvard University) 1965. General Relativistic Pulsation Theory.

## 1970

BARTKOWSKI, RICHARD ROBERT, S.B. (University of Scranton) 1964, A.M. (Harvard University) 1965. Relaxation in Several Magnetic Materials.

BRANDENBURG, GEORGE WARNER, A.B. 1965. The Reaction ( $\pi\rho\rightarrow\rho\pi+\pi-\pi-\pi^0$ ) at 13 and 20 GeV/c.

CANTOR, ARNOLD JULES, S.B. (Brooklyn College) 1955, A.M. (Harvard University) 1956. Chiral SU (3) X SU (3) and the Decay:  $\eta\rightarrow3\pi$ .

ENTIS, ALLAN CECIL, B.J. Ed. (Hebrew Teachers College) 1962. A.B. (Harvard University) 1963, A.M. (ibid.) 1966. Photoproduction of Neutral K Mesons at 10 GeV.

FOGEDBY, HANS CARSTAN, M.Sc. (University of Copenhagen) 1965. Interacting Magnons in the Linear Chain.

FOLLETT, THOMAS LOCKWOOD, S.B. (Case Institute) 1964, A.M. (Harvard University) 1966. Spin-Rotation Interactions in C<sub>3y</sub> Molecules.

FORSTER, DIETER, Dipl. Fuer Physik (Technische Hoch. Stuttgart) 1964. A Microscopic Theory of Fluid Dynamics.

FRANCIS, SAMUEL HOPKINS, A.B. (Yale University) 1964, A.M. (Harvard University) 1968. A Kinetic Model for Dense Fluids.

GREENBERG, WILLIAM, A.B. (Princeton University) 1963, A.M. (Harvard University) 1965. High Temperature Properties of Quantum Lattices.

GRIFFITHS, DAVID JEFFERY, A.B. 1964, A.M. 1966. Covariant Approach to Massless Field Theory in the Radiation Gauge.

HOROWITZ, PAUL, A.B., 1965, A.M. 1967. Optical Studies of Pulsars.

KIRKPATRICK, EDWARD SCOTT, A.B. (Princeton University) 1963, A.M. (Harvard University) 1966. Topics in Electronic Structure Alloys.



KNOTT, THOMAS FREDERIC, A.B. 1962, A.M. 1965. Nuclear Orientation of  $^{110m}\text{Ag}$ .

KRITAYAKIRANA, KOPR, B.Sc. (Chulalongkorn University) 1962, A.M. (Harvard University) 1965. Optical Spectra of Hexagonal Rare Earth Manganates.

LEVIN, DAVID NORMAN, A.B. (Swarthmore College) 1964, A.M. (Harvard University) 1965. Some Aspects of Low Energy Theorems and Current Algebra.

LITKE, ALAN MICHAEL, A.B. (The Johns Hopkins University) 1964, A.M. (Harvard University) 1966. Experiments with Electron-Positron Colliding Beams.

MANSFIELD, JOHN EDWARD, A.B. (University of Detroit) 1960, S.M. (St. Louis University) 1963, Ph.L. (ibid.) 1963, A.M. (Harvard University) 1966. Electromagnetic Mass Splittings in a Second Order Bootstrap.

OLIN, ARTHUR, B.Sc. (McGill University) 1965. Changes in the Decay Constant of Niobium  $90^m$  in Superconducting Niobium, Niobium Pentoxide, and Niobium (Aqueous Floride).

PEABODY, GERALD EARL, A.B. (University of California at Berkeley) 1963, A.M. (Harvard University) 1965. Magnetic Flux Penetration into Superconducting Thin Films.

PUSKIN, JEROME, S., A.B. (The Johns Hopkins University) 1964, A.M. (Harvard University) 1966. Low Energy Gamma Rays in the Atmosphere.

SAH, RICHARD CHIH-PING, A.B. (Swarthmore College) 1964, A.M. (Harvard University) 1967. Muon Tridents.

SNYDER, RALPH BROCKETT, A.B. (Princeton University) 1959, A.M. (Harvard University) 1961. Relativistic Energies in Isoelectronic Sequences.

STANFIELD, KENNETH CHARLES, S.B. (University of Texas) 1964, A.M. (Harvard University) 1966. Quasi-Elastic Electron Scattering and Pion Electro-production off  $\text{C}^{12}$  from 1.0 to 5.0 BeV.

VALBERG, PETER ALEXIS, A.B. (Taylor University) 1964, A.M. (Harvard University) 1966. Hydrogen Maser Measurement of the Hydrogen-Rubidium Atomic Magnetic Moment Ratio.

WINKLER, PAUL FRANK, S.B. (California Institute of Technology) 1964, A.M. (Harvard University) 1965. A Precise Determination of the Proton Magnetic Moment.

ZEE, ANTHONY, A.B. (Princeton University) 1966, A.M. (Harvard University) 1968. Asymptotic Symmetry, Duality, and Electromagnetic Masses.

ZITZEWITZ, PAUL WILLIAM, A.B. (Carleton College) 1964, A.M. (Harvard University) 1965. Surface Collision Frequency Shifts in the Atomic Hydrogen Maser.