

CONTENTS

PART VIII. RADIOACTIVE DECAY

E. Segrè

1. Introduction	1
2. Continuum Theory	2
A. One Substance. B. More than One Substance. C. Branching. D. Units and Standards in Radioactive Measurements. E. Dosimetry.	
3. Fluctuations in Radioactive Decay	23
A. General Theory. B. Applications.	
4. Measurement of Decay Constants	42
A. Methods. B. The Constancy of Radioactive Decay. C. Measurement of Branching Ratios.	

PART IX. ALPHA-RADIOACTIVITY

G. C. Hanna

1. Factors Governing Energy Release	55
A. Elementary Considerations Based on the Liquid-Drop Model. B. Observed Behavior. C. Discussion. D. Prediction of Decay Energies: Nuclear Masses.	
2. Factors Governing Lifetime	76
A. Introduction. B. The One-Body Model of Alpha-Decay in a Central Field. C. Comparison with Experimental Data. D. Advances in the Theory of Alpha-Decay.	
3. Experimental Methods	165
A. Detection of Alpha-Particles. B. Energy Measurements. Table: List of Alpha-Emitters.	

PART X. GAMMA-RAYS

Martin Deutsch and Otto Kofoed-Hansen

1. Properties and Detection of Gamma-Rays	259
A. Types of Electromagnetic Interactions. B. Sources of Gamma-Rays. C. Detection of Gamma-Rays.	
2. Gamma-Ray Energy Determinations	266
A. Absorption Measurements. B. Secondary Electron Methods. C. Magnetic Analysis of Secondary Electron Spectra. D. Proportional Counter	

Methods for Secondary Electron Energies. E. Conversion Electron Energies. F. Energy Measurement by Photodisintegration. G. The Crystal Grating Method. H. Gamma-Ray Energy Standards.	
3. Emission Rate of Gamma-Rays	314
A. General Expressions for Emission Rates. B. Selection Rules. C. Specific Nuclear Models.	
4. Measurement of Transition Probabilities	326
A. Direct Lifetime Measurements. B. Time of Flight. C. Width of Nuclear Levels. D. Resonance Scattering and Absorption. E. Excitation by Charged Particles.	
5. Other De-Excitation Rates	339
A. Theory of Internal Conversion. B. Discussion of the Point Nucleus Assumption. C. Measurement of Conversion Coefficients. D. Internal Pair Creation. E. Zero-Zero Transitions.	
6. Angular Distributions and Angular Correlations	373
A. Simple Theoretical Considerations. B. General Theory. C. Measurements of Angular Correlation. D. Some Results from Correlation Experiments.	
7. Experimental Applications to Decay Schemes and Empirical Data	398
A. Decay Schemes. B. $E1$ Transitions. C. $E2$ Transitions and Levels in Even-Even Nuclei. D. Isomeric Transitions.	

PART XI. BETA-RAYS

Martin Deutsch and Otto Kofoed-Hansen

1. Properties and Detection of Beta-Rays	427
A. Some Properties of Electrons. B. Sources of Electrons. C. Absolute Beta-Counting. D. Fundamentals of Beta-Decay.	
2. Measurement of Electron Spectra	450
A. Magnetic and Electric Deflection. B. Magnetic Spectroscopes. C. Sources and Detectors for Spectrometers. D. Proportional Counter Spectrometers. E. Tracks in Emulsions and Cloud Chambers.	
3. Shapes of Beta-Ray Spectra	506
A. Simple Theoretical Considerations. B. General Theory. C. Selection Rules, Matrix Elements, and Spectral Shapes. D. Spectra of Allowed Transitions. E. Spectra of Forbidden Transitions.	
4. Lifetimes of Beta-Decay	537
A. The ft Value. B. Matrix Elements from Nuclear Models and Comparison with Empirical Data. C. Electron Capture.	
5. Experiments Concerning Neutrinos	566
A. Attempts at Direct Neutrino Detection. B. Neutrino Mass. C. Recoil Experiments. D. Generalization of Beta-Decay Theory to Parity Non-con-	

servation and Consideration of Further Conservation Laws. E. Experiments with Polarized Nuclei. F. Polarization of Electrons. G. Beta-Gamma Circularly Polarized Correlation Experiments. H. Summary and Conclusion on Modern Experiments.

6. Higher-Order Processes 610
 A. Internal Bremsstrahlung. B. Double Beta-Decay.

PART XII. PARTICLE ACCELERATORS

Edwin M. McMillan

1. Early History, 1926-1933 639
 A. Introduction. B. Accelerators Depending on the Electrostatic Potential. C. Methods of Acceleration without Using High Voltages.
2. "Potential Drop" Accelerators 657
 A. Classification. B. A-C and Pulsed Machines. C. D-C Machines Using Rectifiers. D. The Pressure-Insulated Van de Graaff Machine.
3. The Fixed-Frequency Cyclotron 668
 A. The 27½-Inch Cyclotron at Berkeley. B. Other Cyclotrons. C. The Relativistic Limit on Cyclotron Energies. D. The 60-Inch Cyclotron at Berkeley.
4. The Betatron 680
 A. Introduction. B. Elementary Theory. C. Some Typical Betatrons. D. The Biased Betatron. E. Radiation Losses. F. Removal of the Electron Beam. G. Kerst's 300-Mev Betatron. H. Continuation of Theory. Orbit Stability.
5. The Synchrotron, the Synchrocyclotron, the Proton Synchrotron, and Related Machines 695
 A. Introduction. B. Classification and Nomenclature. C. Theory of Phase Stability. D. The Synchrocyclotron (37-Inch and 184-Inch at Berkeley). E. The Electron Synchrotron. F. The Proton Synchrotron.
6. The Linear Accelerator 739
 A. Introduction. B. Types of Linear Accelerators. C. The Traveling-Wave Electron Accelerator. D. The Standing-Wave Proton Accelerator.
7. Strong-Focusing Accelerators 761
 A. Introduction. B. Theory. C. Applications.
- Author Index 787
- Subject Index 803