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Autore	Gargiulo Simone
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Sommario/riassunto	For decades, scientists have envisioned the possibility of storing energy in the form of nuclear excitations, resulting in specific nuclear configurations known as isomers. These unique metastable states have the ability to maintain their excited state for periods that range from several years to time spans exceeding the age of the Universe. However, despite numerous research efforts, achieving effective and practical control over isomer activation or depletion continues to be an unresolved challenge. This book delves into the world of isomers, beginning with an accessible overview of their essential properties and significance as long-duration energy storage solutions. Across the

chapters, the book delves into diverse electromagnetic mechanisms responsible for nuclear excitation. It presents the ongoing debate surrounding the Nuclear Excitation by Electron Capture (NEEC) process, offering a comprehensive historical background that ranges from its early proposal to the latest tools employed for its investigation. The subsequent chapter explores the possibilities of using muons, introducing a novel process called Nuclear Excitation by Free Muon Capture (NEC). The primary aim of these sections is to identify methods that could either increase the likelihood of these nuclear processes or provide real-time external manipulation over them. In the last chapter, the book revisits the process of nuclear photoabsorption in optical laser-generated plasma through experimental efforts, offering a fresh interpretation of existing literature results. Overall, the book delivers a clear and comprehensive overview, aiming to assist newcomers and established scientists in quickly grasping the core aspects of the subjects, possibly guiding their research endeavors. Hopefully, this resource will act as a catalyst for sparking new ideas while providing insights into the intricacies and opportunities presented by nuclear excitations within the realm of nuclear physics.