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1934 marked the centenary of Mendeleev's birth, and many scientists took the opportunity to share their views on the evolution and future of the Periodic System in light of the recent developments in the understanding and conception of matter. In June of that same year, Enrico Fermi published the result of a nuclear process he interpreted as having produced two transuranic elements, which eventually led to the discovery of nuclear fission but also initiated the quest for transuranic elements with nuclear means. More than chemists situating themselves or their community in the history, the fascinating feature is how much it reveals of the diversity in use and users of the Periodic System and its graphical representations. This paper aims at throwing light on these local appropriation process, and will draw on publications authored by Lise Meitner and Ida Noddack devoted to the Periodic System and its future, written from the perspectives of a nuclear physicist and a chemist experienced in searching for undiscovered elements, respectively.