Chapter 5
From Cambridge to Vienna: The Scintillation Counter in Female Hands

Bringing money and instruments into an institute that is barely supporting its personnel might be necessary, but it is surely not sufficient for boosting it to the forefront of scientific research. The skills and the ingenuity of the experimenters are those elements that give life to the material culture of the discipline and often rework its theories. Hans Pettersson had both. He was keen in designing experiments, but he was also impulsive enough to have "big ideas"[1] and persistent enough to pursue them. In a field that only "the Devil knows what can happen anytime," Pettersson was not afraid to play along.[2] 1

In the early 1920s, the most challenging set of problems in radioactivity research was related to artificial disintegration. In 1919, Rutherford noticed an anomalous effect in the collision of alpha particles with nitrogen. When pure nitrogen was bombarded by fast radium C alpha particles, long-range atoms arose from the collision. Those were probably "atoms of hydrogen or atoms of mass 2. If this be the case," Rutherford argued, "we must conclude that the nitrogen atom is disintegrated under the intense forces developed in a close collision with a swift alpha particle and that the hydrogen atom which is liberated formed a constituent part of the nitrogen nucleus."[3] 2

In the fall of 1919, when Rutherford took over the directorship of the Cavendish Laboratory in Cambridge, he pursued his earlier studies on artificial disintegration with great zeal. As Jeff Hughes has documented, Rutherford reorganized the Cavendish Laboratory as a whole by introducing this new research program.[4] An inflow of research students, changes in the material culture, and a spatial rearrangement of the laboratory marked his arrival in Cambridge. By the end of March 1920, Rutherford had concluded that the particles from nitrogen were actually hydrogen nuclei, as he had first speculated.[5] 3

In the course of 1921, Rutherford tested a series of light elements for the disintegration phenomenon with the help of James Chadwick, his research student in Manchester. Chadwick had followed him to Cambridge, serving as a reliable and experienced experimenter in his team. As they both concluded, only these elements whose atomic mass was given by $4n + 2$ or $4n + 3$ where n was a whole number, expelled long-range disintegration particles. Seventeen other elements, 4