Rutherford's Famous Experiment: Unveiling the Atom's Structure Rutherford's gold foil experiment, conducted by his students Geiger and Marsden, revolutionized our understanding of the atom. Alpha particles, emitted from a radioactive source, were directed at a thin gold foil. The majority of particles passed straight through, indicating that atoms are mostly empty space. However, a small percentage were deflected, some even bouncing back. This unexpected result led to several key conclusions: * **The atom has a tiny, dense, positively charged nucleus:** The deflected alpha particles were repelled by this nucleus, suggesting it contained most of the atom's mass. * **Most of the atom's volume is empty space:** The fact that most alpha particles passed straight through implied that the atom was mostly empty. * **Dalton's model was incorrect:** Dalton's model of a solid, uniformly dense sphere was disproved, as alpha particles should have been reflected back if it was true. * **Thomson's model was also insufficient:** While Thomson's model proposed a positively charged sphere with embedded electrons, it failed to explain the large deflections observed. Rutherford's model, based on these findings, envisioned the atom as a miniature solar system. Electrons, negatively charged particles, orbit a central, positively charged nucleus. This model, however, lacked an explanation for the stability of the atom. Why didn't the electrons, attracted to the nucleus, spiral inward and collide with it? This question led to further advancements in atomic theory, ultimately paving the way for the development of quantum mechanics.