…I would like to use this example to show how you often stumble upon facts by accident. In the early days I had observed the scattering of -particles, and Dr. Geiger in my laboratory had examined it in detail. He found, in thin pieces of heavy metal, that the scattering was usually small, of the order of one degree. One day Geiger came to me and said, “Don’t you think that young Marsden… ought to begin a small research?” Now I had thought that too, so I said, “Why not let him see if any -particles can be scattered through a large angle.” I may tell you in confidence that I did not believe that they would be, since we knew that the -particle was a very fast massive particle, with a great deal of energy, and you could show that if the scattering was due to the accumulated effect of a number of small scatterings the chance of an -particle’s being scattered backwards was very small. Then I remember two or three days later Geiger coming to me in great excitement and saying, “We have been able to get some of the a-particles coming backwards…”. It was quite the most incredible event that has ever happened to me in my life. It was almost as incredible as if you fired a 15-inch shell at a piece of tissue paper and it came back and hit you. On consideration I realized that this scattering backwards must be the result of a single collision, and when I made calculations I saw that it was impossible to get anything of that order of magnitude unless you took a system in which the greater part of the mass of the atom was concentrated in a minute nucleus. It was then that I had the idea of an atom with a minute massive center carrying a charge…

 Now let us consider what deductions could be made at this stage. By considering how close to the nucleus the -particle could go, and yet be scattered normally, I could show that the size of the nucleus must be very small. I also estimated the magnitude of the charge... The result was rough but quite sufficient: it indicated that the charge on the nucleus was roughly proportional to the atomic weight.