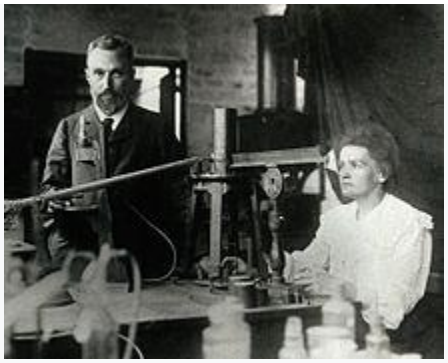
New elements



Pierre and Marie Curie in the laboratory

In 1895, Wilhelm Roentgen discovered the existence of X-rays, though the mechanism behind their production was not yet understood.[29] In 1896, Henri Becquerel discovered that uranium salts emitted rays that resembled X-rays in their penetrating power.[29] He demonstrated that this radiation, unlike phosphorescence, did not depend on an external source of energy but seemed to arise spontaneously from uranium itself. Influenced by these two important discoveries, Curie decided to look into uranium rays as a possible field of research for a thesis.[13][29]

She used an innovative technique to investigate samples. Fifteen years earlier, her husband and his brother had developed a version of the electrometer, a sensitive device for measuring electric charge.[29] Using her husband's electrometer, she discovered that uranium rays caused the air around a sample to conduct electricity. Using this technique, her first result was the finding that the activity of the uranium compounds depended only on the quantity of uranium present.[29] She hypothesized that the radiation was not the outcome of some interaction of molecules but must come from the atom itself.[29] This hypothesis was an important step in disproving the assumption that atoms were indivisible.[29][30]

In 1897, her daughter Irène was born. To support her family, Curie began teaching at the École Normale Supérieure.[24] The Curies did not have a dedicated laboratory; most of their research was carried out in a converted shed next to ESPCI.[24] The shed, formerly a medical school dissecting room, was poorly ventilated and not even waterproof.[31] They were unaware of the deleterious effects of radiation exposure attendant on their continued unprotected work with radioactive substances. ESPCI did not sponsor her research, but she would receive subsidies from metallurgical and mining companies and from various organizations and governments.[24][31][32]

Curie's systematic studies included two uranium minerals, pitchblende and torbernite (also known as chalcolite).[31] Her electrometer showed that pitchblende was four times as active as uranium itself, and chalcolite twice as active. She concluded that, if her earlier results relating the quantity of uranium to its activity were correct, then these two minerals must contain small quantities of another substance that was far more active than uranium.[31][33] She began a systematic search for additional substances that emit radiation, and by 1898 she discovered that the element thorium was also radioactive.[29] Pierre Curie was increasingly intrigued by her work. By mid-1898 he was so invested in it that he decided to drop his work on crystals and to join her.[24][31]