
Interview: H el ene Langevin-Joliot

‘Science Is a Human Adventure’

H el ene Langevin-Joliot comes from a remarkable family of distinguished scientists. Her grandparents, Marie and Pierre Curie, won the Nobel Prize for physics with Henri Becquerel in 1903, for the discovery of radium. Marie Curie won a second Nobel Prize, for chemistry, in 1911. And Langevin-Joliot’s parents, Ir ene and Fr ed eric Joliot-Curie, won a Nobel Prize for chemistry in 1935, for their discovery of artificial radioactivity. Langevin-Joliot herself is a respected nuclear physicist from the Institute of Nuclear Physics at Orsay, the laboratory set up by her parents.

This interview was conducted by Melanie O’Byrne, science writer at the Department of Energy’s Thomas Jefferson National Accelerator Facility Laboratory in Newport News, Virginia. The interview, which will appear in the Jefferson Laboratory June newsletter, is reprinted here with permission.

O’Byrne: What do you do when you’re not travelling around the world, speaking about your family?

Langevin-Joliot: I try to save part of my time for research. My fields of interest are exotic nuclei and highly excited hole states in medium and heavy nuclei. I don’t travel too much. I generally speak about the Curies and Joliot-Curies in lectures on radioactivity and its applications, on nuclear physics, science, research, or women in science, either for the general public or students. Visits to high schools are occasions for meeting kids, telling them stories and answering questions.

I think that improving the public scientific culture is a major challenge of our time. Showing that science is a human adventure, not only equations and techniques, may help. Important efforts are needed to preserve scientific archives. I am involved in those through my parents’ archives. . . .

O’Byrne: What sparked your interest in science?

Langevin-Joliot: I was a very good student at mathematics and science. I had the feeling that science was something interesting when I heard my parents speaking about it. My mother, especially, gave me the feeling that you didn’t need to be a genius to become a researcher. That was very encouraging. I would otherwise have chosen to do something completely different.

O’Byrne: You completed your baccalaureate exams toward the end of World War II, in a small village?

Langevin-Joliot: My father was a Resistant [Resistance fighter] against German occupation. In Spring 1944, he went into hiding in Paris and decided that it was safer for my mother to leave France and try to reach Switzerland with my brother and me. I took my baccalaureate exam on the way. It happened that the exam was over on June 5. On the morning of June 6, we heard about the allies landing in Normandy and we left to cross the border. It was the best day for this expedition, the Germans having other things in their mind!

O’Byrne: Where did you conduct your Ph.D. research?

Langevin-Joliot: At the nuclear physics and chemistry lab at the Coll ege de France. My thesis was on internal Bremsstrahlung and auto-ionization phenomena. I worked alone for some five years, preparing the apparatuses, performing the experiments and discussing them with theoreticians. I started as a probationer at the CNRS (France’s national scientific research center) and became a permanent researcher even before defending my thesis. . . . Then our lab moved to the new nuclear physics Institute at Orsay and I turned to medium-energy nuclear reactions. My mother had discovered the Orsay site; she had obtained government funding for a new lab and ordered a synchro-cyclotron. Such a machine could not be built inside Paris at the Radium Institute or the Coll ege de France. She died in March 1956, before the lab was built.

My father spent the remaining two years of his life realizing the program they had decided together.

O’Byrne: Are others in your family interested in science, too?

Langevin-Joliot: Yes, my husband, Michel Langevin, was a nuclear physicist at the Institute. My son, Yves, is an astrophysicist, mainly interested in planetology and asteroids. My brother, Pierre, is a biophysicist working on photosynthesis.

O’Byrne: What do you remember about Marie Curie?

Langevin-Joliot: I do not have a clear memory of my childhood, and my parents did not tell me that I had a very famous grandmother! I have some memories of Marie with me in the Luxembourg Garden in Paris. My few direct memories are mixed with photographs, home movies, and my parents’ memories.

O’Byrne: Do you remember your parents winning their Nobel Prize?

Langevin-Joliot: It was at a time when we shifted from Paris to the new house my parents built in the suburbs. I can recall them saying they won the Nobel Prize but it did not mean much to me at the time!

O’Byrne: Ir ene and Fr ed eric observed the neutron, but did not know what it was. James Chadwick went on to get the Nobel Prize for that. Later Ir ene observed what turned out to



Helène Langevin-Joliot (left) during a special talk at Georgetown University, arranged by Prof. Azam Nirooman-Rad (right), the vice president of the International Organization of Medical Physics.

be fission. How did that make your parents feel?

Langevin-Joliot: When fission was discovered at the end of 1938, I heard my parents comment, “Maybe if we had worked together, we could have discovered fission!” From 1935 on, you see, my father had focussed on building accelerators. The Joliot-Curies were not the first to “observe” neutrons. At the end of 1930, Walther Bothe and Herbert Becker had discovered a mysterious radiation, which penetrated matter much more than usual ones, attributing it to very high-energy gamma rays.

Note that physicists were much puzzled by cosmic rays; they did not know of the pair effect and of positrons. In mid-January 1931, my parents discovered that the Bothe and Becker radiation projected out energetic protons from hydrogenous matter. They published the result of this key experiment immediately, suggesting a kind of Compton effect. Their note (in French) was read in Cambridge, England, the next week.

After confirming the surprising Paris results, James Chadwick started his decisive experiments to check if the radiation could be that neutral particle (a very tightly bound proton-electron system) suggested by Rutherford several years before. After the discovery at the end of February, the neutron finally turned out not to be the Rutherford particle, but that is another story.

O’Byrne: Your parents actually saw the first atomic bomb.

What were their feelings and reactions?

Langevin-Joliot: They were stricken but not surprised with the power of the bomb dropped on Hiroshima and Nagasaki. Then, as with many nuclear physicists, they were eager with the hope of preventing a nuclear arms race. The Cold War, unfortunately, prevented any agreements for years. My parents were very much involved in the Peace Movement and the Stockholm appeal against atomic bombs.

O’Byrne: Marie Curie and Irène Joliot-Curie were never accepted into the French Academy of Sciences yet Frédéric Joliot was. What do you think of that?

Langevin-Joliot: No women, or at most very few, belonged to scientific academies, whatever the countries, in those times. The situation has improved slightly now, but not enough. Marie was not elected when she tried in 1911, and she never tried again because of the vicious attacks she had suffered—against her work, against women, against a woman of foreign origin.

My mother presented her candidature after the Second World War, also without success. She found the situation comical and tried to be elected at every possible occasion, three times, but she died before succeeding. Marguerite Perey, who discovered francium, later became the first woman accepted into the French Academy of Sciences.

O’Byrne: What is your advice to young students and physicists?

Langevin-Joliot: You need a love of the idea of physics and a love of doing physics—and they are not the same thing. Try not only to read papers but also to visit labs to see what doing research means in the different fields. It is better not to choose the same thing as everyone else. If you are becoming a physicist, try to resist the increasing tendency toward aggressive competition among individuals. Research is a very demanding activity, but perhaps the best success may be achieved by a right balance: between your involvement in personal as well as collective research efforts, personal and family life, and your responsibility as a scientist and a citizen in society.

O’Byrne: What is your message to the public regarding fear of radiation?

Langevin-Joliot: Earth is naturally radioactive; otherwise it would already be a dead planet. We live in a bath of radiation from rocks, gas, and space, with some 7,000 becquerels (the number of nuclei that decay per second) inside our body. We get enormous benefits from the use of radiation, especially in medicine. Nuclear energy, whose wastes are hugely radioactive, has the advantage of producing no carbon dioxide. I regret that the necessary efforts to handle nuclear wastes properly have been underestimated for many years. New programs are developing seriously now, and I am convinced that safe answers could be found to the problem.