Pierre And Marie Curie Essay, Research Paper

Pierre and Marie Curie

and the Discovery of Polonium and Radium

Introduction

Marie and Pierre Curie’s pioneer research was again brought to mind when on 20 April last year, their bodies were taken from their place of burial at Sceaux, just outside Paris, and in a solemn ceremony were laid to rest under the mighty dome of the Panthéon. Marie Curie thus became the first woman to be accorded this mark of honor on her own merit. One woman, Sophie Berthelot, admittedly already rested there but in the capacity of wife of the chemist Marcelin Berthelot (1827-1907).

It was François Mitterrand who, before ending his fourteen-year-long presidency, took this initiative, as he said ‘in order to respect the equality of women and men before the law and in reality’ (’pour respecter enfin….l’égalité des femmes et des hommes dans le droit comme dans les faits’). In point of fact – as the press pointed out – this initiative was symbolic three times over. Marie Curie was a woman, she was an immigrant and she had to a high degree helped increase the prestige of France in the scientific world.

At the end of the 19th century, a number of discoveries were made in physics which paved the way for the breakthrough of modern physics and led to the revolutionary technical development that is continually changing our daily lives.

Around 1886, Heinrich Hertz demonstrated experimentally the existence of radio waves. It is said that Hertz only smiled incredulously when anyone predicted that his waves would one day be sent round the earth. Hertz died in 1894 at the early age of 37. In September 1895, Guglielmo Marconi sent the first radio signal over a distance of 1.5 km. In 1901 he spanned the Atlantic. Hertz did not live long enough to experience the far-reaching positive effects of his great discovery, nor of course did he have to see it abused in bad television programs. It is hard to predict the consequences of new discoveries in physics.

On 8 November 1895, Wilhelm Conrad Röntgen at the University of Würzburg, discovered a new kind of radiation which he called X-rays. It could in time be identified as the short-wave, high frequency counterpart of Hertz’s waves. The ability of the radiation to pass through opaque material that was impenetrable to ordinary light, naturally created a great sensation. Röntgen himself wrote to a friend that initially, he told no one except his wife about what he was doing. People would say, ‘Röntgen is out of his mind’. On 1 January 1896, he mailed his first announcement of the discovery to his colleagues.’ ….und nun ging der Teufel los’ (’and now the Devil was let loose’) he wrote. His discovery very soon made an impact on practical medicine. In physics it led to a chain of new and sensational findings. When Henri Becquerel was exposing salts of uranium to sunlight to study whether the new radiation could have a connection with luminescence, he found out by chance – thanks to a few days of cloudy weather – that another new type of radiation was being spontaneously emanated without the salts of uranium having to be illuminated – a radiation that could pass through metal foil and darken a photographic plate. The two researchers who were to play a major role in the continued study of this new radiation were Marie and Pierre Curie.

Marie

Marie Sklodowska, as she was called before marriage, was born in Warsaw in 1867. Both her parents were teachers who believed deeply in the importance of education. Marie had her first lessons in physicsand chemistry from her father. She had a brilliant aptitude for study and a great thirst for knowledge; however, advanced study was not possible for women in Poland. Marie dreamed of being able to study at the Sorbonne in Paris, but this was beyond the means of her family. To solve the problem, Marie and her elder sister, Bronya, came to an arrangement: Marie should go to work as a governess and help her sister with the money she managed to save so that Bronya could study medicine at the Sorbonne. When Bronya had taken her degree she, in her turn, would contribute to the cost of Marie’s studies.

So it was not until she was 24 that Marie came to Paris to study mathematics and physics. Bronya was now married to a doctor of Polish origin, and it was at Bronya’s urgent invitation to come and live with them that Marie took the step of leaving for Paris. By then she had been away from her studies for six years, nor had she had any training in understanding rapidly spoken French. But her keen interest in studying and her joy at being at the Sorbonne with all its opportunities helped her surmount all difficulties. To save herself a two-hours’ journey, she rented a little attic in the Quartier Latin. There the cold was so intense that at night she had to pile on everything she had in the way of clothing so as to be able to sleep. But as compensation for all her privations she had total freedom to be able to devote herself wholly to her studies. ‘It was like a new world opened to me, the world of science, which I was at last permitted to know in all liberty’, she writes. And it was France’s leading mathematicians and physicists whom she was able to go to hear, eople with names we now encounter in the history of science: Marcel Brillouin, Paul Painlevé, Gabriel Lippmann, and Paul Appell. After two years, when she took her degree in physics in 1893, she headed the list of candidates and, in the following year, she came second in a degree in mathematics. After three years she had brilliantly passed examinations in physics and mathematics. Her goal was to take a teacher’s diploma and then to return to Poland.

Pierre

Now, however, there occurred an event that was to be of decisive importance in her life. She met Pierre Curie. He was 35 years, eight years older, and an internationally known physicist, but an outsider in the French scientific community – a serious idealist and dreamer whose greatest wish was to be able to devote his life to scientific work. He was completely indifferent to outward distinctions and a career. He earned a living as the head of a laboratory at the School of Industrial Physics and Chemistry where engineeers were trained and he lived for his research into crystals and into the magnetic properties of bodies at different temperatures. He had not attended one of the French elite schools but had been taught by his father, who was a physician, and by a private teacher. He passed his baccalaureat at the early age of 16 and at 21, with his brother Jacques, he had discovered piezoelectricity, which means that a difference in electrical potential is seen when mechanical stresses are applied on certain crystals, including quartz. Such crystals are now used in microphones, electronic apparatus and clocks.

Marie, too, was an idealist; though outwardly shy and retiring, she was in reality energetic and single-minded. Pierre and Marie immediately discovered an intellectual affinity, which was very soon transformed into deeper feelings. In July 1895, they were married at the town hall at Sceaux, where Pierre’s parents lived. They were given money as a wedding present which they used to buy a bicycle for each of them, and long, sometimes adventurous, cycle rides came to become their way of relaxing. Their life was otherwise quietly monotonous, a life filled with work and study.

Persuaded by his father and by Marie, Pierre submitted his doctoral thesis in 1895. It concerned various types of magnetism, and contained a presentation of the connection between temperature and magnetism that is now known as Curie’s Law. In 1896, Marie passed her teacher’s diploma, coming first in her group. Their daughter Irène was born in September 1897. Pierre had managed to arrange that Marie should be allowed to work in the school’s laboratory, and in 1897, she concluded a number of investigations into the magnetic properties of steel on behalf of an industrial association. Deciding after a time to go on doing research, Marie looked around for a subject for a doctoral thesis.

Becquerel’s discovery had not aroused very much attention. When, just a day or so after his discovery, he informed the Monday meeting of l’Académie des Sciences, his colleagues listened politely, then went on to the next item on the agenda. It was Röntgen´s discovery and the possibilities it provided that were the focus of the interest and enthusiasm of researchers. Becquerel himself made certain important observations, for instance that gases through which the rays passed become able to conduct electricity, but he was soon to leave this field. Marie decided to make a systematic investigation of the mysterious ‘uranium rays’. She had an excellent aid at her isposal – an electrometer for the measurement of weak electrical currents, which was constructed by Pierre and his brother, and was based on the piezoelectric effect.