AUSTRALIAN ALMANAC Vol.2 No 30

Educating the Mass Strike: Cosmic Radiation beats Green Fascism

Pierre and Madame Curie

By Gabrielle Peut Part 2 of 4

As this was unfolding, a modern Japan was founded during the 1860s and 1870s, when a handful of Japanese intellectuals translated the works of Hamilton, Friedrich List, and Henry Carey into Japanese, to promote what they themselves called "the American System" in Japan. These Japanese patricians, born noblemen, but becoming ardent supporters of the American Constitution, formed an army to subdue the feudal Tokugawa warlords and restore central government to the young Emperor Meiji in 1868, an event known as the Meiji Restoration.

One of Henry Carey's closest friends and collaborators, U.S. State Department official Erasmus Peshine Smith, was stationed in Japan from 1871 to 1877 as an adviser to the Japanese government's Foreign Ministry on issues of credit, tariffs, education, and bilateral treaty agreements with the western powers. The establishment of the National Bank in 1872 and the enactment of educational reforms to create a literate citizenry, imbued with scientific and technological optimism, were directly due to Smith.

With this platform now established in Russia, Japan and Germany, by the 1890s a historic opportunity for the nations of continental Europe to unite and work together emerged. France's Foreign Minister Gabriel Hanotaux collaborated with Finance Minister Witte of Russia to develop the internal connections of the European nations, moving toward a completed Eurasian Landbridge.

The world was advancing in a way that could smash the power of the British Imperial forces. The British counteroffensive, led by the likes of the son of that dope-sniffing Queen Victoria, the future King Edward VII, struck against all those nations with assassinations, subversion, and fomentation of wars – and ultimately World War I.

Equally horrifying to British Imperial strategists was the work being done in the laboratories, in all fields of science, during the decades after Lincoln's Civil War victory. It was against this scientific renaissance that the Apostles of the Darwin Project for Malthusian genocide were unleashed, to corrupt, pollute, and attempt to destroy the new scientific discoveries and technological advances, including the revolution in physical chemistry, taking place during these years.

Wilhelm Roentgen(1845-1923) and the picture of the X-ray.

Now let's turn to some of those leading scientific thinkers, whose discoveries we have to master if we want to end that murderous British Empire, which still dominates today. I am going to present to you the work of Pierre and Marie Curie.

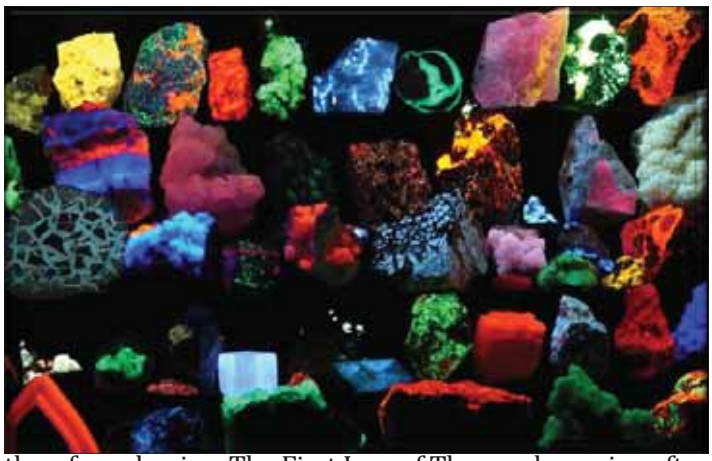
So hopefully, you all remember from Robbie's presentation from yesterday that the German physicist Wilhelm Roentgen in 1895, about six months after Pierre and Marie Curie had gotten married, announced that he had discovered a kind of ray that could travel through solid material. such as wood or flesh. and project an image of its interior, including images of the bones of living people.

Roentgen dubbed these mysterious rays, X-rays.

As you heard from Robbie, Becquerel was curious about this phenomenon, and explored the idea of what was producing these rays, continuing the investigations of his father, who had been studying the phosphorescence of rocks for decades.

Becquerel hypothesized that the luminescence produced from these different types of minerals might be the origin of the X-rays. Using uranium salts, he at first thought that the glow that this mineral produced was because of its exposure to sunlight, that it had simply absorbed the energy from the sun and emitting that energy and

Friedrich List (1789-1846) and the First Major Railroad.



therefore glowing. The First Law of Thermodynamics, after all, specified that energy could be transformed or transmitted from one place to another, but could neither be created nor destroyed. But here was apparently some new source of energy, not transferred from anywhere else, but seemingly being created out of the blue.

So the question arose: Was the luminescence produced merely by the release of energy the uranium salts had absorbed from the Sun? Or, what was hitherto unthinkable, was there a spontaneous emission coming from the mineral itself?

Now this excited the imagination of the scientific world, but it was Henri Becquerel who pursued the investigations, and he eventually discovered that these emissions did not depend on exposure to sunlight, but that the emissions would continue even after the uranium salts had been kept for a long time in darkness.

He discovered this by wrapping the minerals in black paper, and storing them in a dark place, with a cross placed between the wrapped uranium salts and a photographic plate. Lo and behold, days later, there was an image of the cross on the photographic plate. All of a sudden a new phenomenon had been discovered. But what was producing this energy, if not the Sun?

Now Becquerel was excited and he immediately wrote a paper for the French Academy of Sciences. Most scientists, however, were more fascinated by the X-rays themselves, than by the question of what generated them. But the discovery of this new type of energy, known as Becquerel rays, was about to revolutionize science.

A platform was emerging for a whole new arc of discoveries that would overthrow all the previous assumptions and hypotheses about how the universe worked – an explosion in physical chemistry. But the exact nature of the process going on with the rocks still had to be discovered.

Antoine Henri Becquerel (1852-1908) and his earliest image of radioactive uranium.

It took courage to propose a new reality: that, in seeming violation of the First Law of Thermodynamics, some new power existed within the interior of matter, which also meant that even the concept of the atom – a bedrock of chemistry for the previous 100 years – might also need to be modified. Marie and Pierre Curie had that courage, and decided to pursue this new phenomenon.

To understand the "elements," so to speak, of their work, and to really appreciate their contribution to humanity, you have to get to know them first, and theirs is quite an incredible story.

So, who were Pierre and Marie Curie?

Now, I can tell you when I took on the challenge of investigating the work of Marie and Pierre, I wasn't sure at all of what I was looking for. I have no background whatsoever in chemistry, or physics, so all of a sudden I'm plunged into this realm of trying to understand what their breakthroughs meant to the world, but more importantly – and this was the absolute challenge – I had to depart in my mind from finite historical events and processes (even though understanding them is crucial, as we've seen with the history work we've done); I had to depart from that domain and venture into the Cosmos.

Now, when I say the "Cosmos", it's in this domain where all fundamental breakthroughs in knowledge, and in understanding the universe we live in, come from. The Curies' discovery—the identification of Becquerel's curious energetic substance—did not come from the bottom up, it came from the top down. Their minds were governed by going outside the finite space of earth itself, into the cosmos. They understood that what we experience on earth is but a shadow of the organization of the Biosphere as a whole, which envelopes the earth and acts like a transformation region, harnessing cosmic and other radiations for the continual upward or evolutionary development of the universe as a whole (as Ann went through yesterday).

And this was the real scary process for me in doing this class. I know there are a number of people here today who could probably give me chapter and verse on the technical process and all the theories on how the Curies discovered two new elements, radium and polonium, which revolutionized the whole concept of matter and energy, and the atom itself, but that is actually beside the point. The unnerving part is that understanding the minds of the Curies, and what motivated their extraordinary contributions to humanity, meant for me going into the Cosmos—the creative spirit of the Cosmos—where their minds were, which *is* creativity. And I can tell you, to do that, to participate in the process of the highest domain, the Cosmos, and to be self-conscious in that creative process, is to self-consciously participate with God. And, unfortunately, that is not such a natural thing to do. It's very personal and it confronts just how insidious this disease of empiricism is, embedded in one's own thinking, but it also forces a profound change in oneself.

So, today I hope that in presenting the Curies, I capture that idea.

Marie Curie was born in Warsaw, Poland in 1867, as Maria Sklodowska (*skwoh–DOFF–skah)* known by the affectionate nickname for Maria in Polish, which is "Manya"). She was one

Pierre and Marie Curie

of five children. Her life was shaped by the political upheaval, but also the enormous potential, of that period into which she was born. Her parents were leading intellectuals in Poland; they were republican in spirit and had imparted to her, from a very early age, that the freedom of Poland (which had been carved up among three empires since 1794), could only occur through the development of the mind, and by being armed with science. That truly was the essence of the Sklodowski household.

Manya's father would read poetry and literature to them in any of five languages. As Manya herself said,

"Since my childhood I have had a strong taste for poetry, and I willingly learned by heart long passages from our great poets. ... [T]his taste was even more developed when I became acquainted with foreign literatures; my early studies included the knowledge of French, German, and Russian, and I soon became familiar with the fine works written in these languages."

Manya's father would take them on nature trips and taught them about the causes of the beautiful sunsets over the Baltic Sea. Later, in France, she rejoiced at becoming acquainted as Eve her daughter recalled in her biography of her mother, *"with the big waves of the ocean and the ever-changing tide",* and said that *"all her life through, the new sights of Nature made her rejoice like a child."*

But Manya's life was also punctuated by tragedy. Her mother was diagnosed with tuberculosis when Manya was 8 or 9 years of age. She later re-called, *"for in me the natural love of a little girl for her mother was united with a passionate admiration."* The physical distance that kept them apart, for fear of the spread of the disease, affected her deeply and shaped her. She suffered another violent blow with the death of her older sister Sophie at the age of 14, from typhus. Even more heartbreaking was the fact their dying mother had to watch the funeral procession from her bedroom window. Two years later Manya's mother died at age 42.

After spending five years as a governess in Paris, Manya returned to Warsaw to continue her chemistry studies. Since laboratories were banned in Poland within the Russian Empire, she joined an underground college known as the Floating University, where young men and woman could study and be trained by other scientists. This university was run by Polish patriots who saw this as a pathway for the eventual freedom of their nation. Manya and others, including the Polish economist Rosa Luxemburg, were introduced to philosophy, progressive politics, and to the latest developments in chemistry, physics and physiology. Manya's cousin Josef Boguski, who ran the scientific laboratory, had been educated in St Petersburg under the great Russian scientist Dmitri Mendeleyev.

This was a real turning point in Manya's life, because it's where she fell in love with science and experimental work. She reflected later about this period: *"A Scientist in his laboratory is not only a technician: he is also a child placed before natural phenomena which impress him like a fairy tale."*

In her *Autobiographical Notes,* attached to the biography of Pierre Curie which she published in 1923, she said of this period: "... *[D]uring these years of isolated work, trying little by little to find my real preferences, I finally turned towards mathematics and physics, and resolutely undertook a serious preparation for future work."* Mendeleyev, who had predicted not only that many new elements would appear in the Periodic Table of Elements, but also where they would appear, was obviously etched in her mind.

It was in October 1891 that Manya finally entered the *Sorbonne*, the University of Paris, as a student of physics. Upon arrival she changed her name from Manya to the French version, Marie. In 1893 she graduated at the top of her class in physics, the following year she received an additional degree in mathematics, and then she completed her doctorate in physics. She had intended to return to Poland, but was asked by *The Society for the Encouragement of National Industry* to conduct a study of the magnetic properties of steel. Having no laboratory in which to do the research, she made enquiries, and this was when she was introduced to her future husband, Pierre Curie.

Meeting Pierre up-ended Marie's life, and changed all of her goals and dreams. She was passionate and committed to

L'ÉGLISE ET L'UNIVERSITÉ DE LA SORBONNE D'APRÈS UNE GRAVURE DU XVII[E] SIÈCLE.

Sorbonne University

Marie Curie: November 7th, 1867-July 4th, 1934

returning to Poland to liberate her homeland from oppression, and to develop an intellectual cadre of scientifically educated youth. Once again Eve, her daughter, recounts Marie's expressed sense of mission.

"I still believe that the ideas which inspired us then are the only way to real social progress. You cannot hope to build a better world without improving the individuals. To that end each of us must work for his own improvement, and at the same time share a general responsibility for all humanity, our particular duty being to aid those to whom we think we can be most useful."

To this end, Marie dedicated every effort she could possibly muster. Eve, her daughter, adoringly wrote about her mother's early adult years:

"Marie had built for herself a secret universe of implacable rigor, dominated by the passion for science. Family affection and the attachment to an oppressed fatherland also had their place in it: but this was all. Nothing else counted, nothing else existed. Thus she had decreed, the beautiful creature who lived alone in Paris and met young men every day at the Sorbonne and in the laboratory. Marie was obsessed by her dreams, harassed by poverty, overdriven by intensive work. She did not know leisure and its dangers. Her pride and timidity protected her…"

They say opposites attract! When Marie met Pierre Curie for the first time, he was described as a "dreamer absorbed in his reflections". Marie was struck by his open expression and the slight suggestion of detachment in his whole attitude.

She said that their conversation:

"first concerned certain scientific matters about which I was very glad to be able to ask his opinion. Then we discussed certain social and humanitarian subjects which interested us both. There was, between his conceptions and mine, despite the difference between our native countries, a surprising kinship, no doubt attributable to a certain likeness in the moral atmosphere in which we were both raised by our families."

And so the journey began—two brilliant young scientists, dedicated to physics in all its complexity and beauty—a partnership and a marriage made in heaven: the coming together of two individual minds, both contributing to the revolution in science, but made more powerful by their bond of love for each other and for the pursuit of truth.

Their very first meeting was a discussion about Pierre's fascination with crystals. Obviously surprised that Marie asked informed and intelligent questions and understood the technical terms and complicated formulas that he used, he later said of her that "women of genius are rare". It took many months for Pierre to convince Marie to marry him.

But as Pierre declared:

"It would, nevertheless, be a beautiful thing in which I hardly dare believe, to pass through life together hypnotized in our dreams: your dream for your country; our dream for humanity; our dream for science. Of all these dreams, I believe the last, alone, is legitimate. I mean to say by this that we are powerless to change the social order. Even if this were not true we should not know what to do.... From the point of view of science, on the contrary, we can pretend to accomplish something. The territory here is more solid and obvious, and however small it is, it is truly in our possession."

And as Marie later said: *"We must believe that we are gifted for something, and that this thing, at whatever cost, must be attained."*

Pierre Curie was born on May 15, 1859, the second son of Dr. Eugene Curie. Like Marie's father, the senior Curie also participated in the education of his son, who he thought had unusual talents. From a young age, Pierre developed a love of science, particularly mathematics and geometry. As a physicist, he went on to become a pioneer in crystallography, magnetism, and the phenomenon known as piezoelectricity. He and his brother Jacques, who was not only his best friend, but his scientific partner for many years, demonstrated that an electric potential is generated when certain crystals are compressed. This is called piezoelectricity from *piezo,* a Greek word meaning "to squeeze" or "to press").

Pierre made this first scientific breakthrough at just 20 years of age. Marie noted, *"If Pierre's earliest instruction was irregular and incomplete, it had the advantage of not so weighing on his intelligence as to deform it by dogmas, prejudices or preconceived ideas."* He had the freedom of mind to go outside the square, in developing innovative instruments to measure and detect extremely small changes in electrical currents through quartz crystals.

What Pierre and Jacques Curie discovered in their work on piezoelectricity, is that if you compress or squeeze certain crystals, you can induce an electric current to flow. This discovery came out of studies done about 100 years earlier on a phenomenon known as the "*pyro*-electric" effect, whereby it was known that if you *heat* certain crystals, you can generate an electric effect. The Curies were the first to demonstrate the *piezo*electric effect.

With their deep knowledge of crystals, they were able to predict the types of crystals that would produce the piezoelectric effect, by looking at the symmetry of the crystalline structures. The electrometer was a very sensitive instrument which could measure and detect extremely small changes in electrical currents through crystals.

In further work on crystalline structures Pierre Curie later was to take Louis Pasteur's discoveries on the dissymmetry of living organisms to the level of a new, higher hypothesis. I won't repeat the details of what Noelene went through yesterday about Louis Pasteur's experiments on left- and right-handed tartaric acid molecules. Craig will revisit these experiments this afternoon, when he shows you the generalizations made by Vladimir Vernadsky from the work of Pasteur and Pierre Curie on the dissymmetry observed in living processes.

Pierre Curie May 15th, 1859 – April 19th, 1906