NIEPCE DE SAINT-VICTOR AND THE DISCOVERY OF RADIOACTIVITY

Fathi Habashi, Laval University, Quebec, Canada

The discovery of radioactivity is usually credited to the French physicist Antoine Henri Becquerel (1852-1908) who in 1896 discovered the rays that were emitted from uranium salts (1). Becquerel placed fragments of several uraniferous phosphorescent substances on photographic plates wrapped in two sheets of black paper. In about 24 hours, when the plates were developed, a silhouette of the phosphorescent substance appeared on the plate. Hence, it was inferred that *..the phosphorescent salts of uranium must emit radiations which are capable of passing through black paper opaque to ordinary light, and of reducing the silver salts of the photographic plate, even when the uranium compound has been completely sheltered from the light.* The radiations emitted by the phosphorescent substance were called "Becquerel rays." At first, Becquerel thought that these radiations were a kind of invisible phosphorescence, which was afterwards shown to be wrong. For this discovery Becquerel was awarded the Nobel Prize for physics shared with Pierre and Marie Curie in 1903.

Mellor (2) in 1929, however, mentioned briefly that Niepce de St. Victor had already observed thirty years earlier that uranium salts could affect photographic plates in the dark. Mellor stated that Becquerel repeated some experiments of Niepce de St. Victor in order to find "if the property of emitting very penetrative rays is intimately connected with phosphorescence. In other words, does the principle of reversibility apply? If Röntgen's rays make a fluorescent substance shine in the dark, will a fluorescing substance emit invisible penetrative rays?"

In his report to the French Academy of Science published in 1858, i.e., 38 years before Becquerel's report, Niepce de St. Victor stated that (3):

> A drawing traced on a piece of carton with a solution of uranium nitrate…whether or not exposed before to light, and applied on a piece of sensitive paper prepared using silver chloride will print its image...If the drawing made on the carton with the uranium nitrate solution...is traced with large strokes, it will be produced even at 2 or 3 cm further away from the sensitive paper.

With this statement one may conclude that Niepce de St. Victor had discovered radioactivity before Becquerel.

Studies on the effect of uranium salts on a photographic plate were started after the discovery of the metal by Klaproth in 1789. A few years later, since the new metal gives vivid color to glass, a small uranium industry was started by the Austrian Government to produce uranium salts in Joachimsthal in Bohemia. Thus A. F. Gehlen (1775-1815) in Germany in 1804 reported on the color change when an ethereal solution of uranium chloride was exposed to light (4). Other workers attempted to use this phenomenon in a copying process in which paper was soaked with uranium salts then dried. The picture to be copied was then made fully visible after exposure to light by soaking in a solution of silver nitrate then washing. The picture was formed as the result of the photochemical reduction of the uranium salt to uranium oxide which then produced metallic silver by reduction of silver nitrate. Niepce de St. Victor showed such pictures at the Third Exhibition of the Société Française de Photographie in Paris in 1859. He

was able later to give a colored tone to his copies. For example, a violet color was produced when the paper was treated with chlorine, a green color when iron salt was present, and a brown color when potassium ferrocyanide was present. The process was widely publicized as the "uranium paper" or "uranium copying process" and pictures produced by this process were exhibited at the First Photographic Exhibition in Vienna in 1864 (4).

Claude Félix Abel Niepce de St. Victor (1805-1870) was a cousin of Joseph Nicéphore Niepce (1765-1833), the amateur French scientist who, together with Louis Daguerre (1789-1851), developed the photographic picture. He was born in Saint Cyr near Chalon-sur Saône. He attended the school for cavalry at Saumur and became Lieutenant of Dragoons in 1842. In 1845 he was transferred to the Paris Municipal Guard quartered in the barracks of the suburb of Saint Martin, where he equipped a chemical laboratory. His first work, presented to the Academy of Sciences in Paris in 1847 dealt with the condensation of iodine vapors on a copper plate engraving and the reproduction of the iodine vapor image onto metal. In the same year, he made his invention of photography on glass.

Niepce de St-Victor (1805-1870)

In 1848, the barracks in which he lived were burned and his laboratory was destroyed. In the same year he became Captain of his regiment and was elected Chevalier of the Legion of Honor and received also a prize of two thousand francs from the Société d'Encouragement. He improved the asphaltum process of his cousin Nicéphore Niepce and greatly advanced etching on steel. When he was appointed Squadron Leader and Commander of the Louvre in Paris, he had time for his experiments and it was during this period that he investigated photography with uranium salts. He was pensioned when Napoleon III came to the throne, and in his retirement he continued his research on scientific photography. He authored: *Traité pratique de gravure heliographique sur acier et sur verre*, Paris, 1856 and *Recherches photographiques*, Paris, 1858 (5).

In conclusion, the fact that Mellor had pointed out that Niepce de Saint-Victor, an amateur photographer, should be credited with the discovery of radioactivity and not Antoine Henrie Becquerel, prompted the present writer to pursue the matter further. By reviewing the history of uranium salts in photography during the nineteenth century, it could be concluded that Mellor's point of view is valid.

REFERENCES AND NOTES

1. A. Romer, Ed., *The Discovery of Radioactivity and Transmutation*, Dover Publications, New York, 1964.
2. J. W. Mellor, A *Comprehensive Treatise on Inorganic and Theoretical Chemistry*, Longmans, London, 1929, Vol. 4, 52-59.
3. "Un dessin tracé sur une feuille de carton avec une solution d'azotate d'urane….exposé à la lumière ou isolé, et appliqué sur une feuille de papier sensible préparée au chlorure d'argent, imprime son image…Si le dessin fait sur le carton avec la solution d'urane… est tracé à gros traits il se reproduira à 2 ou 3 centimètres de distance du papier sensible. Ce n'est donc pas à la phosphorescence ou à la fluorescence seule qu'on peut attribuer la propriété remarquable que possède les solutions d'urane".
4. Quoted by F. Kirscheimer, *Das Uran und seine Geschichte*, Schwarzerbart'sche Verlagsbuchhandlung, Stuttgart, 1963.
5. J. M. Eder, *History of Photography*, translated from the 3rd German ed. of 1905, Columbia University Press, New York, 1945, Dover Publications, New York, 1978.

ABOUT THE AUTHOR

Fathi Habashi is professor of extractive metallurgy at Université Laval, Faculté des Sciences et de Génie, Département de Mines et Métallurgie, Cité Universitaire, Québec, G1K 7P4, CANADA. He authored *Principles of Extractive Metallurgy* in 4 volumes and edited *Handbook of Extractive Metallurgy* in 4 volumes.