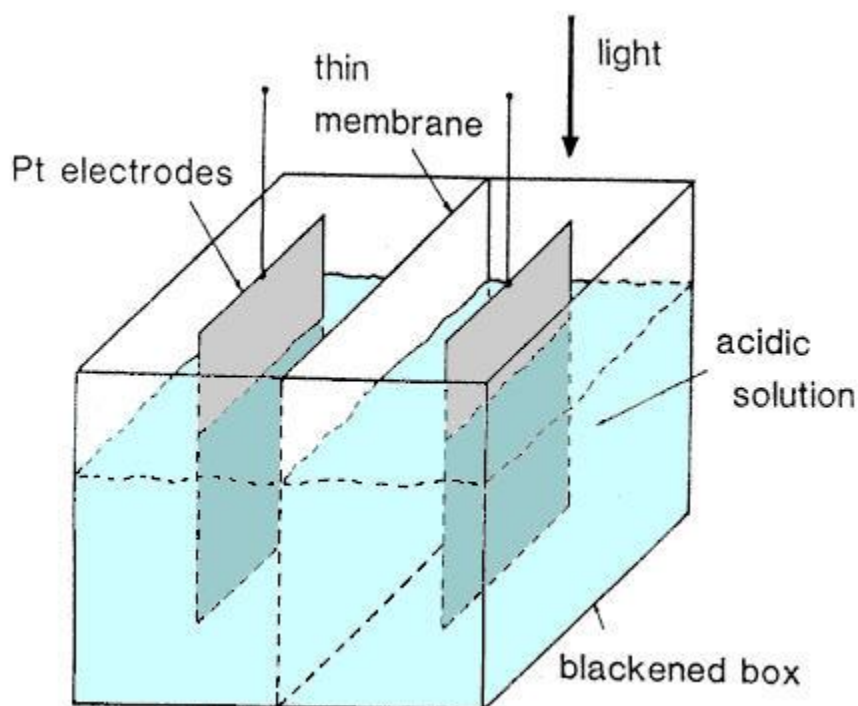


Photovoltaic History

Edmond Becquerel appears to have been the first to demonstrate the photovoltaic effect in 1839. Working in his father's laboratory as a nineteen year old, he generated electricity by illuminating an electrode with different types of light, including sunlight (see the figure below). Best results were obtained with blue or ultraviolet light and when electrodes were coated with light sensitive material such as AgCl or AgBr. Although he usually used platinum electrodes, he also observed some response with silver electrodes. He subsequently found a use for the photovoltaic effect by developing an "actinograph" which was used to record the temperature of heated bodies by measuring the emitted light intensity.

A. E. Becquerel, "Recherches sur les effets de la radiation chimique de la lumiere solaire au moyen des courants electriques", *Comptes Rendus de L'Academie des Sciences*, vol. 9, pp. 145-149, 1839.

A. E. Becquerel, "Memoire sur les effects d'electricques produits sous l'influence des rayons solaires", *Annalen der Physick und Chemie*, vol. 54, pp. 35-42, 1841.



In 1887, a young German scientist named [Heinrich Hertz](#) observed the photoelectric effect and the production and reception of electromagnetic (EM) waves. He published these observations in the journal *Annalen der Physik*. His receiver consisted of a coil with a spark gap, where a spark would be seen upon detection of EM waves. He placed the apparatus in a darkened box to see the spark better. However, he noticed that the maximum spark length was reduced when in the box. A glass panel placed between the source of EM waves and the receiver absorbed ultraviolet radiation that assisted the electrons in jumping across the gap. When removed, the spark length would increase. He observed no decrease in spark length when he substituted quartz for glass, as [quartz](#) does not absorb UV radiation. Hertz concluded his months of investigation and reported the results obtained. He did not further pursue investigation of this effect, nor did he make any attempt at explaining how this phenomenon was brought about.

Hertz, Heinrich (1887). "[Ueber einen Einfluss des ultravioletten Lichtes auf die electrische Entladung](#)". *Annalen der Physik*. **267** (8): 983–1000.

April 25, 1954: Bell Labs Demonstrates the First Practical Silicon Solar Cell



Calvin S. Fuller at work diffusing boron into silicon to create the world's first solar cell

Solar cells, which convert sunlight into electrical current, had their beginnings more than a hundred years ago, though early solar cells were too inefficient to be of much use. In April, 1954, researchers at Bell Laboratories demonstrated the first practical silicon solar cell.

Early inventions paved the way for the modern silicon cell, most notably by French physicist A. E. Becquerel in 1839 who discovered the photo-electric effect- the birth of the photovoltaic cell. It was in 1883 that the first cell was built by Charles Fritts. These cells used a layer of gold to form junctions and were about 1% efficient.

A few iterations later, the modern silicon cell was stumbled upon by Bell Labs in 1954. While researching semi-conductors, scientists realized that when silicon was combined with certain “impurities” it became highly sensitive to light.

Daryl Chapin, Calvin Fuller and Gerald Pearson, all of Bell Labs, converted the accidental discovery into the first practical device that converted sunlight into energy, the beginning of modern solar energy. Dubbed a solar battery, the first modern silicon cells debuted by powering a toy windmill and a radio, reaching an efficiency level of 6 percent.

The silicon cells became the basis for launching the solar energy industry. One year later, Western Electric licensed commercial solar

cell technologies, and in 1957 the three scientist received a U.S. patent for a “Solar Energy Converting Apparatus.”

Shortly thereafter, in March of 1958, the scientists at Bell Labs reached true “stardom,” as the U.S. satellite Vanguard I was launched with solar panels. This use of solar energy helped to spur government investment into solar energy, further bolstering the creation of the solar energy industry.