

Historic STEM Women/Technology:***Hedy Lamarr (1914-2000)**

A beautiful movie star of the 1940's, Lamarr also was a polymath. In 1942 she patented frequency-hopping communication, a highly efficient technical method of using multiple radio frequencies simultaneously without interference to each other. It is the basic technology of the cell phone, bluetooth, wi-fi and all other wireless communications.

<http://www.cnet.com/news/happy-100th-birthday-hedy-lamarr-movie-star-and-wi-fi-inventor/>

***Mary Engle Pennington, PhD (1872-1952)**

A bacteriological chemist, Pennington developed methods of handling, packaging, and preserving food during the Industrial Revolution. At the time, contamination was a major health issue transporting food long distances as people moved from farms to cities. Pennington researched chilling temperatures to prevent bacterial growth and preserve quality. She created scientific standards for storage and transportation of perishables, such as milk, poultry, eggs, and fish, but most importantly, ice cream. She designed refrigerated railroad cars and industrial freezers, as well as refrigerator-freezers for the home. Today's commercial refrigerated and frozen food sections are a direct result of her innovations. The egg carton is her design. Recruited by the US Department of Agriculture (USDA) in 1905, Pennington worked for the passage of the first, 1906 Pure Food and Drug Act, which led to the formation of the Food and Drug Administration (FDA). In 1908 she became Chief of the Food Research Lab for the FDA.

<http://www.chemheritage.org/discover/online-resources/chemistry-in-history/themes/public-and-environmental-health/food-and-drug-safety/pennington.aspx>

***ENIAC Women (1946)**

Six women wrote and programmed the technology known today as software, for an empty computing machine that men built. His hardware with her software became the world's first computer known as ENIAC (Electronic Numerical Integrator and Computer). It measured 8 by 3 by 100 ft., covered 1,800 sq. ft. of floor space, weighed 30 tons, contained about 18,000 vacuum tubes, 70,000 resistors, 10,000 capacitors, 6,000 manual switches and 5 million soldered joints. It completed the computations these women did using the slide rule, differential analyzer, and electronic calculators, but in a fraction of the time, after the women had transformed their computations into the first software programs which these women installed in the first computer. The first time the ENIAC women were acknowledged, even mentioned, for their technical development of software was not until fifty years later.

<http://www.columbia.edu/cu/computinghistory/eniac.html>

***Rear Admiral Dr. Grace Murray Hopper, BA (1906-91)**

A computer scientist, Hopper began a pioneering effort of UNIVAC I, the first large-scale electronic digital computer. She developed an entire programming language using English, despite being told she couldn't do this because computers didn't understand English. As one of two technical advisers, she defined the basic COBOL

language, which led to international standards for most computer programming languages. She was awarded the first ever Computer Science Man-of-the-Year Award (1969) and many other awards. Her four decades of pioneering contributions to computer science paved the way for today's modern data processing technology.

http://www.thocp.net/biographies/hopper_grace.html

***WASP (Women Airforce Service Pilots)**

A 1943 World War II volunteer program of experienced female civilian pilots who wanted to serve their country but as women could not join the US Armed Forces. Founded by pilot Jacqueline Cochran, the program was designed to test and to declare safe both new and repaired aircraft before male pilots in the US Air Force would be allowed to fly them. The women pilots had to complete over 300 hours of academic studies in: math, physics, maps, navigation, principles of flight, engines and propellers, weather, code, instrument flying and communications, plus 137 hours in military training, twenty-four in advanced equipment, and 103 in PE and first aid. With aircraft technology still in its infancy, safety of the aircraft was unknown until their testing in the air was complete. Virtually every type of aircraft (including early jets) flown by the USAAF men during WW II were first flown by technically sound and savvy women pilots.

<http://twudigital.contentdm.oclc.org/cdm/landingpage/collection/p214coll2>

***MERCURY 13**

In 1960-61, thirteen women who became known as the Mercury 13, secretly and independent of each other, trained to be astronauts, but never became such only because they were women. They were experienced pilots, most with more completed flight hours than the Mercury 7 male astronauts, but they were not male. President Dwight Eisenhower clearly stated he wanted only jet test pilots considered for the space program. His requirement covertly eliminated all women. All jet test pilots were men. On a letter to NASA outlining women's training and drafted for his signature, Vice President Johnson, overt in his tenet on women in the space program, affixed not his signature, but the words, "Let's Stop This Now!" Now lasted twenty-two years until 1983 when Sally Ride became the first female United States' astronaut in space.

<http://www.bbc.com/news/science-environment-36824898>

***Stephanie Kwolek, BS (1923-2014)**

A research chemist with her bachelor degree in chemistry from Carnegie Mellon University, Kwolek created Kevlar, a material once mere fiction in Superman's suit. While working for DuPont, Kwolek developed a crystalline solution she wanted spun into fiber. But the technician in charge of the machine to spin it refused stating the solid particles in the material would clog the tiny holes of the spinneret. Kwolek knew solid material was not in her solution and over the course of weeks, persuaded the technician to spin it. The fiber results were astonishing. Her amazing material is now found in snow skis, boats, bullet-resistant vests, athletic shoes, boots, airplanes, etcetra. It is strong yet can shave 800 pounds off an aircraft frame. NASA used a 12-mile Kevlar cable (thinner than a pencil) to secure a 1,200-pound satellite during a space shuttle mission. In 1971, Kwolek had invented a remarkable technology and a fiber that would forever change the field of polymer chemistry.

<http://www.chemheritage.org/discover/online-resources/chemistry-in-history/themes/petrochemistry-and-synthetic-polymers/synthetic-polymers/kwolek.aspx>