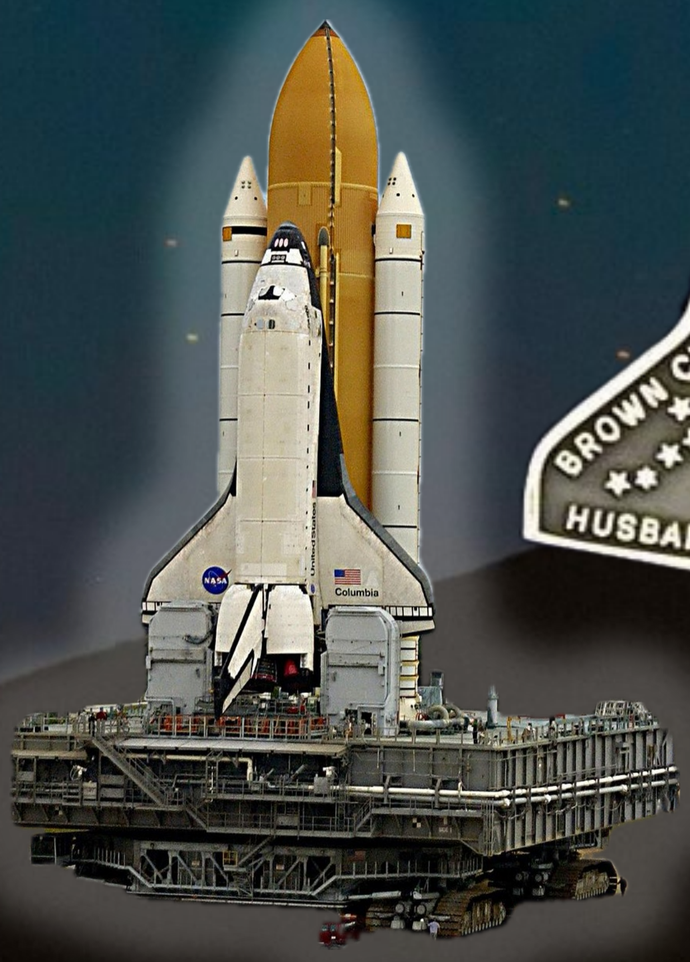
KALPANA CHAWLA

Kalpana Chawla (Born on March 17, 1962 in Karnal, India) was the 1st woman of Indian origin to go to space on the NASA Space Shuttle *Columbia* as a mission specialist and robotic arm operator. Chawla flew aboard STS-87 (1997) and STS-107 (2003) to investigate the effects of microgravity on various technologies. STS-107 further discovered a new atmospheric phenomenon: Transient Ionospheric Glow Emission in Red (TIGER). Tragically, Chawla and her crew would perish upon the reentry of STS-107 from damage to the thermal protection system on Feb. 1, 2003. Since her passing, the U.S. and India government have named spacecrafts and satellites in her honor.

As a child, Chawla watched airplanes with her father and quickly developed an interest in flight. Chawla pursued her interests and studied aerospace engineering in college. Many professors attempted to dissuade her studies as few opportunities existed for women in aerospace in India at the time. Chawla remained adamant in her career, moving to the U.S. in 1982 to seek her own career opportunities and joining NASA in 1988.







MARGARET H. ROUSSEAU

Margaret H. Rousseau (Born on Oct. 27, 1910 in Houston, TX) was the 1st woman to earn a Ph.D. in chemical engineering in the U.S., the 1st woman member of the American Institute of Chemical Engineers (AIChE), and the 1st person to commercialize antibiotic production.

Margaret H. Rousseau obtained her B.S. in chemical engineering at Rice University and her Ph.D. at MIT with her thesis on *the effects of solute on the liquid film resistance in gas absorption.* Upon graduating in 1937, Rousseau worked at E. B. Badger industries producing synthetic rubbers. At the start of WWII, Rousseau shifted her career to work at Pfizer and used her experiences with chemical synthesis and distillation to industrialize the production of penicillin. Using large vats to culture penicillium molds on cantaloupes, Rousseau's design would produce over 2.3 million doses of penicillin for U.S. soldiers in 1944 and help drop the death rate of bacterial pneumonia from 18% to 1%.



Despite her accomplishments, fellow engineers would underestimate her expertise as she worked to industrialize ethylene glycol, acetic acid, and high-octane jet fuel.



Penicillin production deep vats used during WWII.

MARIE M. DALY

Marie Daly (Born on April 16, 1921 in New York City, NY) was the 1st African-American Woman in the U.S. to obtain a Ph.D. in Chemistry. Daly was a fast-learner and hard-worker, earning fellowships for her master's and Ph.D. degrees and finishing her master's degree at NYU in a single year. Daly obtained her Ph.D. from Columbia and studied human health. Crucially, Daly would uncover the link between high cholesterol and clogged arteries, revolutionizing the understanding diet and heart health at the time.

Throughout her career, Daly was also committed to developing programs to increase the enrollment of minority students in medical school and graduate science programs. During her professorship at Albert Einstein College, she helped run the Martin Luther King – John F. Kennedy program designed to help prepare black students for graduate admissions. With the American Association for Advancement in Science, Daly contributed to *Double Bind: The Price of Being a Minority Woman in Science* (1996), an article which directly addresses the challenges faced by minority women in STEM.



The Double Bind:

The Price of Being a Minority Woman in Science

Shirley Mahaley Malcom
Paula Quick Hall
Janet Welsh Brown

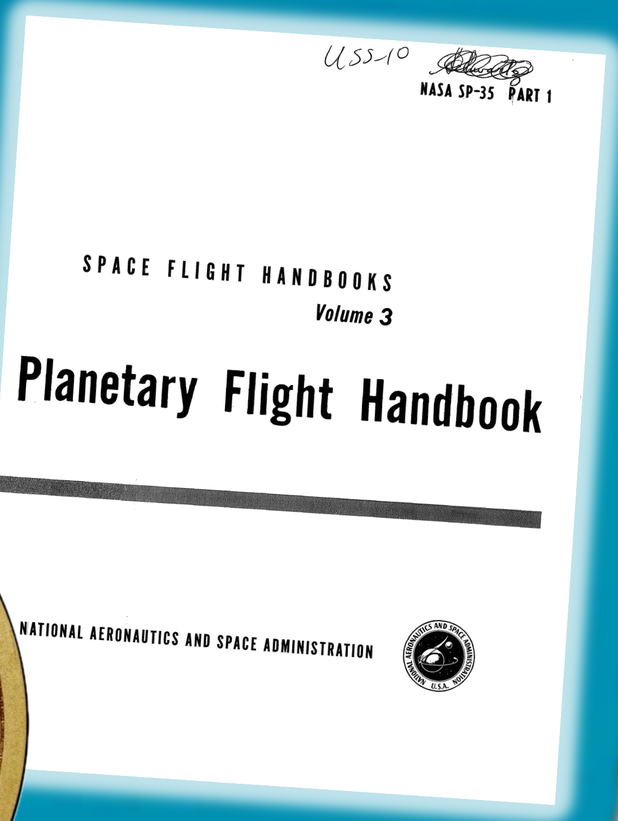
MARY G. ROSS

Mary Ross (Born on Aug. 9, 1908 in Parkhill, OK) was the 1st Native American woman engineer and 1st woman engineer at Lockheed Corp. Ross began her career as a math teacher and girls student advisor at government-run Native American boarding schools in New Mexico. As many of her Native American students were separated from their Native communities to be placed in school, Ross proudly shared her Cherokee culture throughout her teachings and viewed her heritage as a source of inspiration. At the start of WWII, Ross joined many Native Americans in answering the call to national service and joined Lockheed as a mathematical research assistant.

Despite sexist hiring practices and work environments, Ross became 1 of 40 founding engineers for Lockheed's Advanced Development Programs in 1939. Notably, she helped improve the design of the P-38 Lightning fighter plane and contributed to NASA's *Interplanetary Flight Handbook* (1963).






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Mary G. Ross depicted on the 2019 U.S. $1 coin.

REBECA GERSCHMAN

Rebeca Gerschman (Born on June 19, 1903 in Buenos Aires, Argentina) was an Argentinian biologist and physiologist who 1st discovered the role of oxygen radicals in cell death and aging in her 1953 *Science* paper *Oxygen Poisoning and X-Radiation: A Mechanism in Common*. Through her research at Buenos Aires University, Gerschman conducted experiments on the physiological effects of hyperbaric oxygen conditions. Utilizing experimental observations and theory, she discovered that oxidative free radicals can damage DNA and inhibit healthy gene expression. Her theory would not gain wide acceptance in the scientific community, however, due to its controversy with contemporary views and insufficient acceptance of women in science. Her research was recognized only after another group confirmed her findings in 1969 and is now considered the foundation of research in oxygen toxicity. Gershman was considered for a Nobel prize in for her discovery but would pass away before she could receive the award.



The Argentinian Ministry of Science, Technology, and Innovation has named the Rebeca Gerschman Award in Honor of Dr. Gerschman and recognizes prominent woman scientists in Argentina.

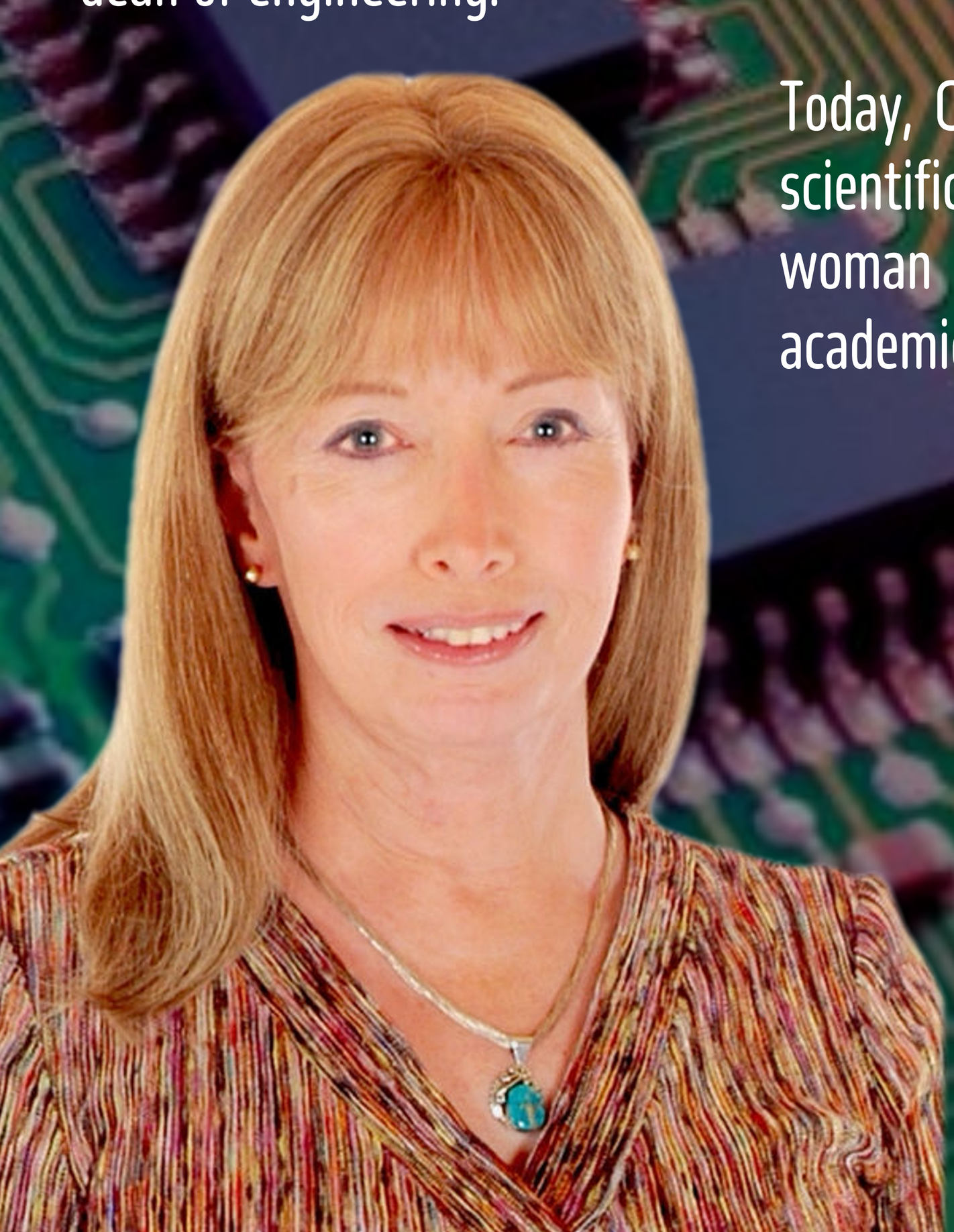
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Argentina

LYNN CONWAY

Lynn Conway (Born on Jan. 2, 1938 in Mount Vernon, NY) is a previous University of Michigan Associate Dean of engineering, co-inventor of the Mead-Conway VLSI microchip design, National Inventors Hall of Fame Inductee, and openly transgender woman. Due to open discrimination against transgender people, however, Conway kept her gender identity a secret until her retirement in 1998. Having previously been fired from IBM for her gender transition, Conway achieved her largest accomplishments with a hidden identity.

Conway's work on Very-Large-Scale Integrated chip design at Xerox became standard in microchip design and simplified the production of multiple-circuit microchips. Upon publishing her textbook *Introduction to VLSI Systems*, Conway taught the first VLSI Chip Design course at MIT in 1978. In 1985, Conway joined the University of Michigan and continued to teach as a professor of electrical engineering and computer science and as an associate dean of engineering.



Today, Conway continues to advance the scientific community as an advocate for woman and transgender equity in academic and industrial workspaces.

