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# Trailblazing Women in Science

Discoveries made by female scientists continue to change the world

AS YOU READ, THINK ABOUT the challenges women historically faced when pursuing careers in science.

March is Women's History Month!

THROUGHOUT HISTORY, women have made many groundbreaking contributions to science, from programming the first computers to determining the makeup of stars. But for centuries, women were discouraged or outright barred from working in science, technology, engineering, and math (STEM) fields. Often, female scientists weren't given credit for the discoveries they made. "It took an amazing mind, incredible talent, and a great degree of resilience and grit to overcome the obstacles that early women scientists faced," says Gloria L. Blackwell, chief executive officer of the American Association of University Women. Read about some of the scientific advances made by inspiring women throughout history and how their modern counterparts are following in their footsteps. ✨

—Hailee Romain

## 1 Atomic Innovators

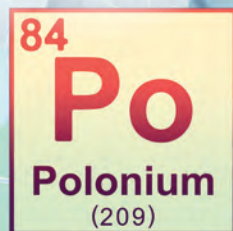
**Marie Curie** conducted some of the first research into *radioactivity*. A chemist and a physicist, she found that certain elements break down over time and, in the process, release energy. In 1903, Curie became the first woman to win a Nobel Prize for her discovery of the radioactive element polonium (Po). She later won a second Nobel for isolating radium (Ra)—another radioactive element.

Curie's work opened new possibilities in the field of medicine. For example, X-ray images that show the inside of people's bodies rely on radiation. The discovery of radioactivity also led to new ways to produce energy.

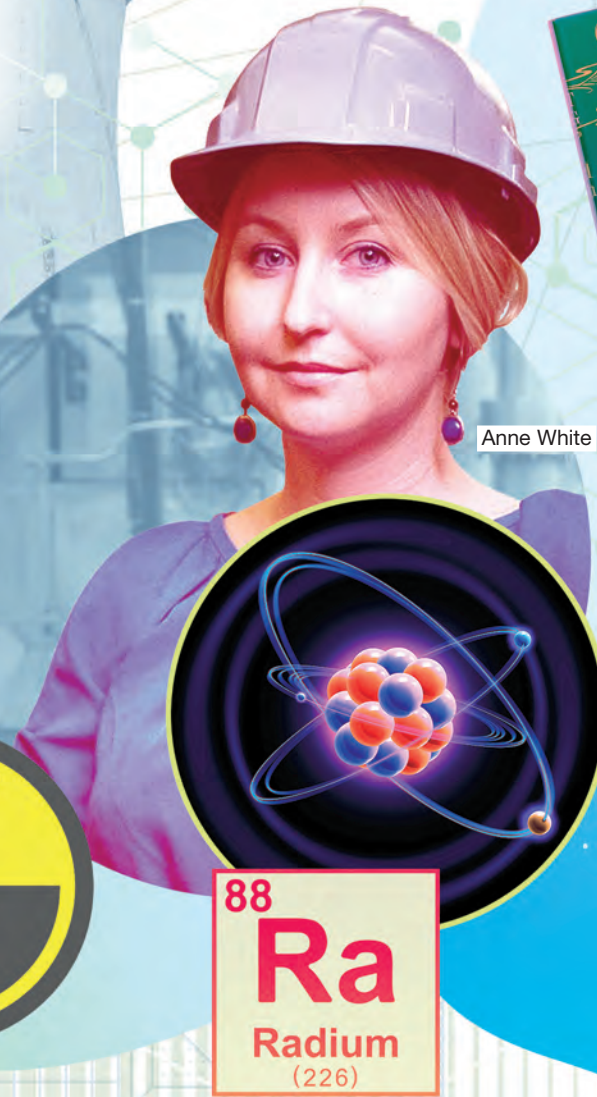
**Anne White**, a physicist at the Massachusetts Institute of Technology, is a leading expert in *nuclear fusion*—a reaction in which atoms fuse together and release energy. Nuclear fusion could produce an almost unlimited amount of power. And it wouldn't create

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Marie Curie



Anne White



Rachel Carson



## Environmental Protectors

**Rachel Carson** launched the modern environmental movement. Born in Pennsylvania in 1907, she started her career as an aquatic biologist working for the U.S. Bureau of Fisheries. She was also an avid nature writer. In 1962, she released the book *Silent Spring*, in which she discussed the harmful effects of insect-killing pesticides on the environment. Though chemical companies tried to discredit her findings, Carson's efforts inspired a conservation movement that led to the banning of some of the most harmful pesticides. It also led to the creation of the U.S. Environmental Protection Agency, which is responsible for enforcing environmental regulations.

"Rachel Carson took on huge industries and powerful people in order to protect the environment," says **Corina Newsome**. "I think we face similar challenges today." Newsome is an *ornithologist*, or bird scientist, who works as the community engagement manager for the conservation group Georgia Audubon. There, she develops educational programs and works to get people involved in conservation efforts. An important part of her job is to balance environmental initiatives with the needs of local communities. "My goal is to make conservation as diverse and equitable as possible," she says.

hazardous waste like current nuclear power plants that rely on *nuclear fission*, or splitting atoms to create energy, do.

Nuclear fusion generates temperatures up to six times as hot as the sun's core. This amount of energy is extremely difficult to contain. White, though, thinks nuclear fusion has the potential to become a revolutionary energy source and is developing ways to make that possible.



Corina Newsome

Turn page for more.

### 3 Space Explorers

Astronomer **Cecilia Payne-Gaposchkin** transformed our understanding of stars. In the early 1900s, scientists believed that the sun had a similar composition to Earth. But in 1925, while working on her Ph.D., Payne-Gaposchkin proposed that the sun and other stars were made mostly of just two elements: hydrogen (H) and helium (He). Her idea was initially rejected as impossible by a prominent male astronomer. He confirmed her conclusion a few years later and took most of the credit. Thanks to Payne-Gaposchkin, we now know that hydrogen and helium are, in fact, the most abundant elements in the universe.

Modern astronomers like **Munazza Alam**, a researcher at the Carnegie Earth and Planets Laboratory in Washington, D.C., are still seeking to understand the composition of objects in space. Alam studies the chemicals that make up the atmospheres of *exoplanets*. To date, scientists have located nearly 5,000 of these planets outside our solar system. “Many of these worlds are more exotic than we could ever have imagined,” says Alam. “My goal is to figure out how these planets formed and evolved.” Ultimately, Alam would love to find an Earth-like exoplanet—one with a climate like that of our own world that could potentially harbor life.



Cecilia Payne-Gaposchkin

Munazza Alam

### 4 Pioneering Programmers

**Grace Hopper** is considered one of the most influential computer scientists in history. In 1945, during World War II, she joined the U.S. Naval Reserves. There, she worked on the MARK I—one of the first computers. The machine took up an entire room and read *code*, or instructions, consisting of lines of holes punched in paper tape. After the war, Hopper created the first *compiler*. This computer program translates text-based instructions into a mathematical language that a computer can understand. Hopper's ideas formed the basis for how people communicate with computers.

Today, billions of people rely on computer programs like those devised by Hopper to run cell

phones, video game systems, and other electronic devices. Computer engineers like **Yoky Matsuoka** are pushing computers' capabilities even further. Matsuoka is a robotics expert and tech entrepreneur who recently launched a personal-assistant company. In 2007, she won the prestigious MacArthur “Genius Grant” for developing a prosthetic arm that allows wearers to move the fingers in a lifelike way. She's also one of the founders of Google's research and development group that's creating cutting-edge technologies like self-driving cars and virtual reality.

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Grace Hopper with MARK I

Yoky Matsuoka with prosthetic arm

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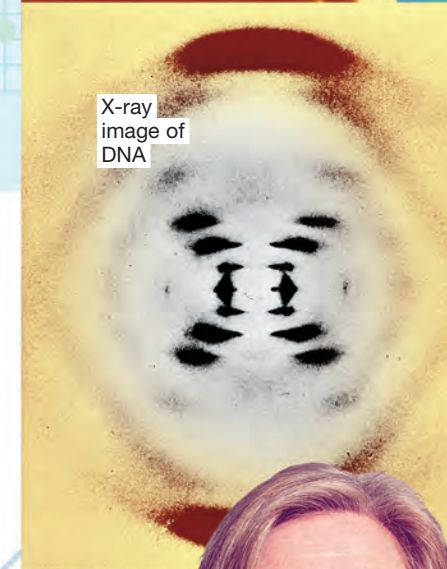
### Unlocking DNA's Secrets

Molecular biologist **Rosalind Franklin** was instrumental in unraveling the mysteries of *DNA*—the molecule that carries hereditary information. In the 1950s, scientists were trying to understand this complex molecule's structure and how it functioned. Franklin helped solve part of that mystery. In 1952, she took X-ray photographs of DNA. Those images led to the discovery of DNA's double helix shape, which looks like a twisted ladder.

Today, scientists know that DNA is made up of units called *genes*. They hold the instructions for how an organism will look, develop, and function. In the 2010s, **Jennifer Doudna**, a biochemist at the University of California, Berkeley, helped develop a tool called *CRISPR* that can change how genes work. CRISPR uses a set of molecules to target and alter genes. CRISPR technology is still extremely new, but scientists have already begun testing it to treat certain inherited diseases and to disable viruses that make people sick. In 2020, Doudna and her colleague Emmanuelle Charpentier won the Nobel Prize in Chemistry for their CRISPR tool.



Rosalind Franklin



X-ray image of DNA



Jennifer Doudna



**OBTAINING INFORMATION:** Choose one of the scientists mentioned in the article. Research to find out more about her life and work.