

# MAKERS

## WOMEN IN SPACE

### BACKGROUND:

**MAKERS: Women in Space** chronicles the crucial and often unsung role women have played in the US space program. The film is both a look back as well as a glimpse of the important role women will continue to play in the future of this field.

The story of women in the US space program starts in 1957, as the United States raced to beat the Soviet Union at sending a human being into orbit. Randy Lovelace devised NASA's tests to select America's first astronauts; thirteen women were included in the trial. While this rigorous testing proved that women were ready to go into space, in the end America wasn't yet ready to put women into space. This setback wasn't the end. By the mid-1970s, America was starting to change in terms of its treatment of women and NASA actively began to employ women. They even hired Nichelle Nichols, Star Trek's Lt. Uhura, to be the public face of NASA and help recruit women and minorities to the space program. Sally Ride would become the first woman to launch into space. Integrating women into the astronaut corps proved surprisingly easy. The biggest challenges the male engineers designing the program confronted were how women would go to the bathroom in space and what to do if the women got their periods there. By the 1990s, there were new milestones; Eileen Collins became the first woman pilot astronaut. Just a few years later, Collins became the first woman commander, making history once again. The space race continues and women are in it.

The program includes interviews with Eileen Collins, as well as Sally Ride's classmates Shannon Lucid, Rhea Seddon and Kathryn Sullivan, and features Mae Jemison, the first woman of color astronaut, and Peggy Whitson, the first female commander of the International Space Station. The hour ends with the next generation of women engineers, mathematicians and astronauts—the new group of pioneers, like Marleen Martinez, who continue to make small but significant steps forward. Produced by Michael Epstein and Sara Wolitzky. Directed by Michael Epstein. Narrated by Jodie Foster.

Expanding on the critically acclaimed PBS documentary **MAKERS: Women Who Make America**, which told the story of the modern American women's movement, each documentary in this six-part PBS series examines the impact of the women's movement on six fields once largely closed to women: business, space, Hollywood, comedy, war and politics. In each field, women have pried open, and profoundly reshaped, the central institutions of American life and culture. In the last half-century, women have fought their way into nearly every sphere of American life, from the battlefield to the comedy club, the soundstage to the Senate. Through intimate interviews with trailblazing women known and unknown, viewers are given a rare glimpse—sometimes funny, sometimes sad, and always candid—of what it was like to be pioneers in their fields. Directed by some of the country's leading independent filmmakers, **MAKERS** brings to life new and unforgettable stories that every woman, man, girl and boy should know. Other documentaries in the **MAKERS** series include **Women in Hollywood**, **Women in Business**, **Women in Comedy**, **Women in War**, and **Women in Politics**.

**MAKERS** is also a growing archive of women's stories. At [makers.com](http://makers.com) you can meet over 250 Makers, including many who will particularly amplify the role of women in space:

**France A. Córdova**, an internationally recognized astrophysicist and the youngest person and first female chief scientist at NASA. She later joined Purdue as the university's first woman president. In addition to serving on a myriad of boards, she is a fellow of the American Association for the Advancement of Science, the Association for Women in Science, and has received presidential appointments.

**Mae Jemison** became the first female African-American to become an astronaut and go into space. After NASA, she began teaching at universities like Dartmouth College and Cornell University and founded research groups to continue the development of scientific knowledge. She is a doctor, a dancer, an astronaut and holds nine honorary doctorate degrees in the humanities, science, and engineering.

**Katherine Johnson** is a NASA mathematician, whose computations have influenced every major space program from Mercury through the Shuttle. Johnson's specialty was calculating the trajectories for space shots which determined the timing for launches, including the Mercury mission and Apollo 11, the mission to the moon.

## **POST-VIEWING DISCUSSION QUESTIONS:**

After watching **MAKERS: Women in Space**, can you think of 3 new facts you learned?

If after watching **MAKERS: Women in Space** you found most of the material to be new to you – were you inspired to learn more, angry you never learned this before? How can more people learn this history?

Historian Amy Foster notes “there were very valid reasons for putting women into space – most notably they tended to weigh less.” Given the obvious statistical support for women being astronauts, what stood in the way of more women accessing that opportunity?

The first woman in space was a Russian – why might Russia have been more amenable to sending a woman into space than America?

When the Lovelace tests listed the qualities of what makes a good astronaut, traditionally female attributes consistently emerged as priorities. Women testees passed the Lovelace tests with “flying color.” Why were these physical qualifications not enough to get women into space?

Since women weren't allowed to fly jets or join the military, the Lovelace program died a “quiet death” in 1962. President Johnson's note on a memo “let's stop this now” is the only written evidence of its end. Why would no one take responsibility for the program's demise? Since women could not become astronauts, how did they find ways to contribute to space exploration?

Why did NASA ultimately include women? Offering her expert opinion, Lynn Scherr, Sally Ride's biographer, says it was because laws were changing and discrimination against women in all areas was a much bigger threat. What were other reasons? And what were some of the other areas women had been let out of.

Much of the conversation about women and space talks about how girls should be inspired. What about boys – do boys gain anything by seeing women in space?

After excluding women and people of color for years, NASA struggled in the 1970s to recruit minorities. They asked Nichelle Nichols of Star Trek to become a recruiter for NASA. Think about other ways that pop culture has helped women imagine more for themselves?

In January 1978, NASA announced its first class of shuttle astronauts, which included six women. Why did these women want to become astronauts and are their similar themes in their stories?

Shannon Lucid, one of the six, remembers being told that “you'll never be able to do anything because you are a girl.” If you are or were a girl, have you been told this? Are girls still told this today? How do we stop that message from spreading?

Mike Mullane, 1978 Class Astronaut, admits that he and his classmates had never worked professionally with women. Is that even still possible?

After the Challenger explosion, Lynn Scherr humbly notes that “women were equal in a way we didn't want them to be.” Are there other ways women's humanity has been exposed? Are we as uncomfortable with women's vulnerabilities as men's?

The first woman of color in space, Mae Jemison, says her perspective from space was one of belonging — “I am as much a part of this universe as any speck of star dust. I have a right to be here.” A few years after Jemison went into space, Peggy Whitson and Pam Melroy became the first two female commanders to meet in space. Peggy says it was historic to her because of how “normal” it felt. Are women reaching a more “normal” sense of belonging? What else should we strive for to ensure that women's equal participation in society is more normalized?

SpaceX, under the leadership of Gwynne Shotwell and others, is a private entity jumping into the space race with an ultimate goal of enabling people to live on other planets. If you were to be a part of that pioneering group, what would your planet be and how would it be organized?

## **QUICK FACTS ON WOMEN IN SPACE:**

Valentina Vladimirovna Tereshkova is the first woman to have flown into space.

Mercury 13 refers to the 13 women who underwent and passed the same rigorous screening process as men, but were denied the opportunity to go into space as the Mercury Seven did. This testing included injecting ten degree water into their ears and holding them for hours in isolation tanks. The 13 were: Bernice “Bae” Steadman, Janey Hart, Geraldine “Jerri” Sloan Truhill, Rhea Allison Woltman, Sarah Lee Gorelick Ratley, Jan Dietrich, Marion Dietrich, Myrtle Cagle, Irene Leverton, Gena Nora Jessen, Jean Hixson, Wally Funk and Geraldyn “Jerrie” Cobb.

Dr. Randy Lovelace helped NASA envision “the perfect astronaut” and in doing so realized that women were likely as capable of being astronauts as men. This became known as the Lovelace test.

International Space Station is a space laboratory housed in low Earth orbit. In fact, it can occasionally be seen by the naked eye from earth.

## **QUICK STATS ON WOMEN IN SCIENCE:**

74% of STEM workers are men. Only 26% are female. ([www.millionwomenmentors.org](http://www.millionwomenmentors.org))

Women comprise more than 20% of engineering school graduates, yet only 11% of practicing engineers are women. ([www.millionwomenmentors.org](http://www.millionwomenmentors.org))

The wage gap between women and men is much smaller in STEM occupations than other occupations. In STEM fields, women earn \$0.92 for every \$1 earned by men, compared to \$0.77 for other fields. ([www.millionwomenmentors.org](http://www.millionwomenmentors.org))

Although women fill close to half of all jobs in the U.S. economy, they hold less than 25 percent of STEM jobs. ([www.millionwomenmentors.org](http://www.millionwomenmentors.org))

As of 2013, Nobel Prizes have been awarded to 803 men, 44 women, and 22 organizations. Of the 44 women, 16 were in science (with Marie Curie winning twice).

Breakdown:

There have been 195 Nobel Prize in Physics awards. Only 2 have gone to women.

165 individuals have received The Nobel Prize in Chemistry. Four have gone to women.

There have been 204 Nobel Laureates awarded The Nobel Prize in Physiology or Medicine. Ten have been women.

(from Wikipedia and [nobelprize.org](http://nobelprize.org))

Women make up 58.1% of the overall workforce, but are much less represented in particular science and engineering occupations (U.S. Department of Labor, Bureau of Labor Statistics, Women in the Labor Force: A Databook, 2012). For example:

45.9% of chemists and material scientists are women;

28.9% of environmental scientists and geoscientists are women;

22.3% of chemical engineers are women;

13.1% of civil engineers are women;

8.8% of electrical and electronics engineers are women;

17.8% of industrial engineers are women; and

5.5% of mechanical engineers are women.

(<http://www.ngcproject.org/statistics>)

Minority women comprise fewer than 1 in 10 employed scientists and engineers. (NSF, Science & Engineering Indicators, 2014; NSF, Science & Engineering Indicators, 2012)

## **TIMELINE OF WOMEN IN SPACE:**

- 1958: United States Government forms NASA to help the US jump into the space race.
- 1959: General Donald Flickinger established the Women in Space Earliest (WISE) program.
- 1960: Jerri Cobb works with William Randolph Lovelace to recruit 19 women to undergo the same testing as the Mercury 7. This initiative was funded by the celebrated aviator Jacqueline Cochran.
- 1961: Alan Shepard is the first American launched into space. JFK promises that the US will send an American to the moon within the next decade.
- 1963: First woman, a Soviet named Valentina Tereshkova, in space aboard Vostok 6.
- 1969: Neil Armstrong becomes the first person to walk on the moon.
- 1970s: NASA employs Star Trek star Nichelle Nichols to help them recruit new astronauts.
- 1978: NASA selects the first women to join Astronaut Group 8. These six women (Anna Fisher, Shannon Lucid, Judith Resnick, Sally Ride, Margaret Rhea Seddon, Kathryn Sullivan) were the first American female astronauts.
- 1983: Sally Ride is the first American woman in space.
- 1986: The Challenger explodes killing all on board, including the astronaut Judith Resnick and the teacher/civilian Christa McAuliffe.
- 1991: Martha McSally was the first American woman allowed to fly in combat.
- 1992: Mae Jemison became the first African American women in space.
- 1993: France Cordova became the first female Chief Scientist at NASA.
- 2000: International Space Station Expedition 1 is launched and in the decade since has been visited by over 214 people.
- 2002: SPACEX is launched to ultimately make individual travel into space possible.
- 2008: Peggy Whitson becomes the first woman to command the International Space Station.
- 2011: After spending 159 days at the International Space Station, Cady Coleman returns to earth.
- 2012: More than 30% of NASA's workforces is female; including many supervisors and aerospace engineers.

## **LEARN MORE ABOUT WOMEN IN SPACE:**

SPACE X

1 Rocket Road  
Hawthorne, CA 90250  
[www.spacex.com](http://www.spacex.com)

Sally Ride Science

[www.sallyridescience.com](http://www.sallyridescience.com)

Offering both professional development and student resources, including Summer Science Camps for girls ages 4 to 9.

Dr. Mae

[www.drmae.com](http://www.drmae.com)

The official website of Dr. Mae Jemison. Hosts of both The Earth We Share (TEWS), promoting science literacy, and the Dorothy Jemison Foundation for Excellence, to help support teachers.

100 Year Starship

[www.100yss.org](http://www.100yss.org)

Pushing for human travel to another star in the next century.

NASA

National Aeronautics and Space Administration is the source for all US government supported space initiatives.

[www.nasa.org](http://www.nasa.org)

Kennedy Space Center

See the launch of a real spaceship or just simulate your own launch.

[www.ennedyspacecenter.com](http://www.ennedyspacecenter.com)

## More Information about Women & STEM/STEAM:

Black Girls Code

<http://www.blackgirlscode.com/>

By reaching out to the community through workshops and after school programs, Black Girls CODE introduces computer coding lessons to young girls from underrepresented communities in programming languages such as Scratch or Ruby on Rails.

Code for America

<http://codeforamerica.org>

Citizens and governments can collaborate with Code for America, using technology to find solutions to issues.

Engineering at Smith

<http://www.smith.edu/engineering/>

Learn more about pursuing a degree in engineering.

Girls Make Games

<http://girlsmakegames.com/>

Girls Make Games offers a series of international summer camps, workshops and game jams designed to encourage girls to explore the world of video games.

Girls Who Code

<http://girlswhocode.com/>

Start a Girls Who Code club at your school or sign up for a 7-week immersion summer program.

Made with Code

<https://www.madewithcode.com/>

Design an avatar, code a bracelet, or find a coding event in your area.

Math for America

<http://www.mathforamerica.org/home>

MFA provides classroom and professional resources for math teachers.

Million Women Mentors

<http://www.millionwomenmentors.org>

Find resources and a step-by-step guide on how to become a STEM mentor.

Museum of Math

<http://momath.org/>

A NYC museum dedicated solely to mathematics - plan your visit.

Women and Science at The Rockefeller University

<http://womenandscience.rockefeller.edu/>

The Women & Science initiative supports women in science and offers a platform for showcasing their contributions to society.

Women Enhancing Technology

<http://www.iie.org/en/Programs/WeTech>

WeTech provides a variety of activities and programs for women, linking them to opportunities and supportive networks.

