

A Galaxy of Her Own: Amazing Stories of Women in Space

by Libby Jackson

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There has been little dialogue by business and economic historians with scholars and practitioners on space exploration – currently a nexus between commercial private space and public sector space exploration. Libby Jackson's 2017 book sets the scene for understanding the complexity and importance of space exploration. Jackson is responsible for the UK's Human Spaceflight and Microgravity programmes on the International Space Station. Jackson, though not a trained historian, has had an interest in the development of space exploration and the role played by women. Jackson's book is an examination of over 50 female personalities – and sometimes groups of women – involved in space exploration that is intended for everyone: specialists and enthusiasts alike. The book is a global interdisciplinary perspective that highlights, through the personalities surveyed, that space exploration is pleasantly more open than one would have initially thought. It explains what historians do, in bold pictures, the study of a phenomena through personalities and periods. More specifically, it is the groundwork of space exploration through the lives of extraordinary women.

A Galaxy of Her Own: Amazing Stories of Women in Space succeeds in this goal. It is a book full of the colourful lives of the personalities. The book begins with Jackson's personal odyssey to space exploration, from visiting National Aeronautics and Space Administration (NASA) after sending an unsolicited request, to studying physics at university and then a masters in space engineering, to her time training flight controllers at the European Space Agency. One thing that holds constant in this journey is Jackson's sharp focus on space exploration despite obstacles and barriers to entry into space exploration. In her first year of A levels, when asked what she wanted to do, she said "I want to work at NASA one day" (p. 9). Without thinking for a moment, she sent an email to NASA asking to visit; two weeks later she got a reply accepting her request.

The uniqueness of the book goes beyond the choice of personalities surveyed. Space exploration is an international, broad and interdisciplinary field, and this is a short book. Adopting a historical perspective, Jackson periodises space exploration into five periods: The Origins of Space Travel, i.e. the period pre-1957; The Dawn of the Space Age, 1957–1972; Space Stations and Shuttles, 1972–2000; Living and Working in Space, 2000–present; and The Future of Space–the present. The periodisation of the development of space exploration sets the groundwork for understanding the history of space exploration and will continue to change the world.



Down to the depths of the book, the reason for her choices is quite clear to see. Every sacrifice, contribution and accomplishment by each woman is striking as it is compelling. Most of the women surveyed initially emerge mainly from the USA and the Soviet Union – because of the historical dominance of the USA and the then Soviet Union in the origins of space travel. But this is the only selection criterion offered by Jackson. It would be interesting to know what other inclusion criteria was for the selection of personalities all through the periods, especially the present. Also, to what extent did the author exhaust the period from 2000 to the present? Jackson also does not provide an index or a glossary of words.

All the heroic women profiled are unique in their own different way and have accomplished tremendous feats within a male-dominated area. So the choice to frame the book in terms of women shaping space exploration in the past, the present and the future is understandable. More saliently, though indirectly, Jackson, in telling these women's stories signals to a legion of equality, diversity and inclusion issues that still remain relevant, debated and largely unresolved in contemporary society. Still in highlighting their contributions, Jackson compiles an undeniable case for cognitive, societal and physical diversity and prompts the reader to ponder what could have been gained from active inclusion behaviours throughout history. It should be noted that Jackson has another book published in 2020 that surveys the lives of 25 personalities (male and female) in space exploration.

The sub traits of the periodisation by Jackson sheds lights on the dynamism on of space exploration. The discussions in all periods highlight the intersection between technological development, invention and innovation. The period pre-1957 takes into consideration how the women surveyed shaped the discourse and development of space exploration. Take Émilie du Châtelet (1706-1749). She translated Sir Isaac Newton's *Principia Mathematica* to French when the fundamental laws of physics were still controversial. Furthermore, she was in the middle of the translating *Principia Mathematica* when she got pregnant at the age of 42 and feared she would not survive it at that age. She did but died six days later. When the translation was completed a decade later, it fired up the scientific revolution across Europe. Her translation is still the most widely read version of Newton's book in French. Jackson is consistent and exhausts this period, albeit briefly, to each personality from Ada Lovelace to Jacqueline Cochran in the origins of space travel.

The period from 1957 to 1972 is shaped by the space race and an insight into the reality of what happens when politics meets science. A range of themes emerge in this period: the risks, seizing opportunity, law, sustainability, creative design, innovation and teamwork. Eilene Galloway noticed that the race to conquer space was a military one, a question of "technology and rocket power" (p. 38). However, Eilene also noticed that the race for space need not be militaristic but for a common good and to keep the peace. She was instrumental in the setting up of NASA and drafting the Outer Space Treaty, which set the groundwork for space law and the space for peaceful means. Jackson also introduces the ILC Seamstresses – Ellie Foraker, Madeline Ivory, Bert Pilkenton and Cecil Webb. We do not know about the personal lives of these women, but as a collective their contribution centres on their creativity in design and innovation. Jackson highlights that making a spacesuit for an astronaut is akin to making a mini spaceship. The design has to consider conditions such as "providing air to breathe, communication with the crew and even a nappy just in case" (p. 56). Thus, these are the suits worn by Neil Armstrong and Buzz Eldrin and went on to make suits for eventual Space Shuttle spacewalks and parachutes for Mars rovers.

In contrast to the period 1957–1972, between 1972 and 2000, the USA and the Soviet Union set new goals by working together as opposed to competing with each other. This

period saw the invitation of people from other countries other than the USA and the Soviet Union. Space exploration became an international endeavour. Furthermore, a theme that runs through this period is the heroic bravery and genius by women in space exploration; take Sally Ride or Svetlana Savitskaya. Jackson profiles Patricia Cowing who has been central in investigating space sickness. Her story began with started with spotting the lack of gender diversity in an engineering department course that looked at designing equipment for astronauts. She then became interested in how the mind and body interact: space sickness. She developed technique called Autogenic Feedback Training Exercise – a nonpharmacological countermeasure for mitigating motion sickness. It involves training astronauts how to control physiological responses in highly stressful situations.

From 2000 to present, space exploration has changed dramatically. The risks involved in flying to space is not understated in the book. Kalpana Chawla and Laurel Clark and their other five crew members met a tragic end – an insight into dangers of spaceflight. The themes that run through this period are groundbreaking and revolutionary. Take Anousheh Ansari who has championed space venture philanthropy and space tourism. The Ansari X Prize was a space competition in which the X Prize Foundation offered a US\$10m prize as the first non-government organisation to launch a reusable crewed spacecraft into space twice within two weeks. As such, facilitating the reality of private space exploration. Another theme that runs through this period is the need for sustainability and safety, for instance, Jeanne Lee Crews and Nicole Buckley.

Moving on the present and the future, the ability to drive down the costs of space exploration, e.g. reusable parts of a spacecraft, has been pivotal in ushering private space exploration. Simonetta di Pippo is profiled as the current Director of the United Nations Office for Outer Space Affairs (UNOOSA). UNOOSA works to uphold the five international space treaties thereby laying an emphasis on sustainability. In other words, scientists agree that the record of history on other planets should not be altered, not to introduce life from earth that might destroy or hamper life in space. Thereby offering protection for planets and peace in space.

The book is a call for action. Space exploration has evolved to be an international, interdisciplinary and multi-stakeholder endeavour. Its contributions to science and technology will continue to expand and be called upon as society's relationship with space continues to change. More complex questions around the role of government in space exploration, opportunities in not so "blue ocean" of private space exploration and more controversially space colonisation, will require more nuanced critique and solutions. Diverse thought, sourcing knowledge from all walks of society and actively seeking to include these perspectives will be paramount.

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