

Superhero Scientists: challenging stereotypes in science

Authors David Allen and Alex Sinclair present an extract from their book, which describes the work of scientists from a diverse range of backgrounds



Our book *Superhero Scientists* is a non-fiction text for children to read about people involved in the fascinating world of science. The 21 chapters are full of facts, life stories and scientific discoveries. From astrophysicists to pilots, epidemiologists to vets, marine biologists to scene of crime officers – the book details why they are all superheroes.

Representations of scientists

A great deal has already been shared about the dominant representation of a scientist, as a white male Einstein-like individual dressed in a lab coat, to which children are exposed. Children's science identities and aspirations can be formed by how aligned they are with this version of science (Archer *et al.*, 2020). This is, in part, influenced by the scientists and people involved in science that they come across in their formative years. Our book aims to help them 'meet' a wider range of scientists than previously may have been possible.

We wanted to ensure that our book had representations of scientists of different genders, sexualities, faiths, ethnicities and ability/disabilities. Our aim was for a child to pick up the book to read about scientists and see themselves represented on the pages. We wanted them to think 'Oh, they're like me. That means I can be a scientist!' That said, the particular difference represented by each scientist is not the main focus of their chapter. This information is shared through the introductory biographies, almost as an aside, before the children move on to read about the scientist's work and discoveries. This does not diminish the importance of diversity; instead it offers a holistic approach to the representation of all that the scientists are and what they stand for.

Katherine Johnson

As this edition of *Primary Science* is dedicated to marginalised scientists we have chosen to share one of our favourite chapters with you, about an important space mathematician



NASA mathematician
Katherine Johnson

whose achievements have not always been recognised. Katherine Johnson was an inspiring individual whose work played a huge role in the NASA

Space Program. Some of you may have seen her story played out in the film *Hidden figures*, which celebrates Katherine's achievements alongside other Black American women who worked at NASA in the 1950s and 1960s when segregation laws were still in place. It is crucial that children in our schools are taught about how scientists from all backgrounds have had a positive impact upon our world. Katherine Johnson is just such a person. We hope you enjoy sharing the chapter with your children (to download a copy see end).



Katherine Johnson - Space Mathematician



Katherine Johnson's work as a mathematician played a pivotal role in the NASA (National Aeronautics and Space Administration) space programme.

She was born in 1918 as Creola Katherine Coleman in West Virginia, United States. Her mother was a teacher and her father a handyman at a local hotel. From a very young age she showed that she was an outstanding mathematician and could solve mathematical sums easily. She was advanced for her age and ended up being taught with older children. Geometry was her favourite subject and was the type of maths she used when working for NASA.

The film *Hidden Figures* celebrated Katherine's achievements alongside other Black American women who worked at NASA in the 1950s and 1960s.

In recognition of everything she did she was awarded the US Presidential Medal of Freedom. This is the nation's highest honour for someone who is not in the armed forces. NASA also presented her with the Silver Snoopy and Golden Achievement Award which are for people who have made outstanding contributions to human flight.

She died on 24th February, 2020 aged 101.

During the 1950s, NACA (the National Advisory Committee for Aeronautics, which later became NASA) became very interested in sending humans into space. This required a lot of mathematical computations.

In those days there weren't the high-powered computers that we have today and most calculations had to be carried out by hand. They advertised for mathematicians and I applied to work there.



I really enjoyed mathematics at school. I was so good at it that I started high school many years before my peers. However, my parents had to move to find a school that would accept me because the local council wouldn't let children who were Black American go to school after the age of 13.

In some areas of the United States it was legal to separate black people from white people up until 1964. This was because many white people believed that they were superior because of the colour of their skin alone. This meant that black people were not allowed access to most theatres, restaurants and hotels. They were not allowed to attend the same schools as white people or use the front seats on public transport.

I completed my university degree at a young age and received the highest grades in mathematics and French. Because I found the work easy, my tutor even wrote courses especially for me to study. One of them was on the geometry (a type of mathematics) of space. After graduating I became a teacher at a local Black American public school.



DID YOU KNOW?

It was in 1961 that a Russian, Yuri Gagarin, became the first person in space.



What do you think Katherine's superhero power would be?

I was selected as the first Black American woman to attend West Virginia University to study further maths. I had to withdraw after a year as I found out that I was pregnant with my first child. I had another 2 children but knew that I wanted to continue my studies as soon as I had raised my family.

The first time I applied for the job at NASA there were no vacancies. I was luckier on my second attempt. I worked with a group of women and we thought of ourselves as human computers. It was our job to analyse the data from the black boxes on planes undertaking test flights.



DID YOU KNOW?

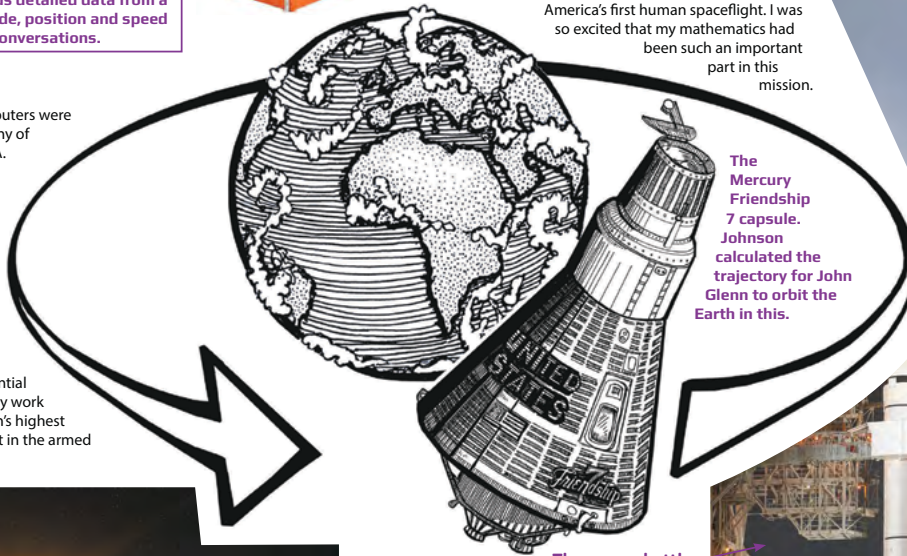
A modern flight recorder (black box) from an aeroplane records detailed data from a flight such as altitude, position and speed as well as all pilot conversations.

In the early 1960s, computers were being used to make many of the calculations at NASA. However, the astronaut John Glenn specifically asked for me, by name, to check over the maths for his spaceflight before he felt safe. I was so proud! In 1962 John Glenn was the first American to orbit the Earth. In 2015 I was awarded the US Presidential Medal of Freedom for my work on this. This is the nation's highest honour for someone not in the armed forces.

Because of segregation laws I had to work, eat and use separate toilets from my white colleagues. However, my work was valued and when NASA was formed in 1958 I was one of the first people to be employed. I never felt inferior to anyone. Leading up to 1961 I calculated the path to be taken by the Freedom 7 spacecraft. This was America's first human spaceflight. I was so excited that my mathematics had been such an important part in this mission.



The Freedom 7 capsule



The Mercury Friendship 7 capsule. Johnson calculated the trajectory for John Glenn to orbit the Earth in this.



The space shuttle ready for take off

I was also a member of the team who worked out where and when to launch the Saturn V rocket for the Apollo 11 mission to the Moon in 1969. This is what I was most proud of. After this I assisted with the space shuttle programmes and even made calculations for future trips to Mars. I loved my work but I retired from NASA in 1986.



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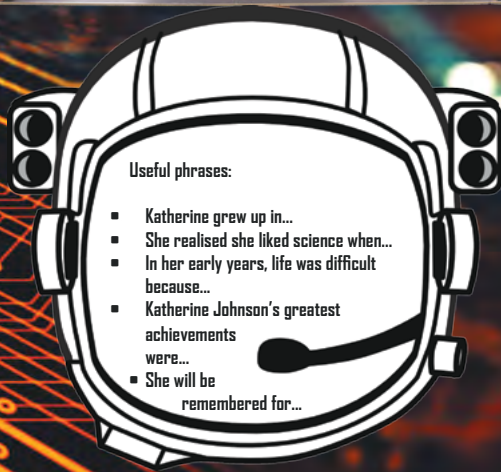
Our new website will celebrate the life and works of amazing scientists!

To apply for a job working for us, create a website page about Katherine Johnson and email us the link.

We look forward to receiving your applications.

David and Alex
Managing directors @ sci-apedia.com

- How to make your website page great:
1. Use the opening statement to introduce Katherine.
 2. Use third person pronouns (she, her, hers, herself, it, its, itself, they, them, their, theirs).
 3. Write in the past tense.
 4. Incorporate important incidents.
 5. Include time connectives to link ideas (before, after, next, afterwards, eventually, firstly, secondly, and thirdly).
 6. Be concise.
 7. Ensure facts are accurate and without bias.
 8. Write in paragraphs.
 9. Use headings, subheadings, bullet points.
 10. Highlight text or use italics to highlight key words that are important (you can add hyperlinks to explain these words).



Useful phrases:

- Katherine grew up in...
- She realised she liked science when...
- In her early years, life was difficult because...
- Katherine Johnson's greatest achievements were...
- She will be remembered for...

Area of science: _____	Scientist: Katherine Johnson
_____	Education: _____
Early life: _____	_____
_____	_____
Career: _____	Occupation: _____
_____	_____
Scientific discoveries: _____	_____
_____	_____
Impact on the world of science: _____	Employer: _____
_____	_____
Other facts: _____	_____
_____	_____

Spreading the word

The book, published in March 2021 by Millgate House Education, the publishing arm of ASE, is now on its fifth print run and the feedback from children, parents and teachers has been overwhelmingly positive. Children are reading the text independently and teachers are using the chapters with their classes to stimulate discussion, as a launching point for further research and to develop literacy skills through the creative writing opportunities at

the end of each chapter. We were thrilled when *Superhero Scientists* was voted the overall 5 Star winner of the 2021 Teach Primary Awards in the STEM category, acknowledging the diverse range of scientists included in the book.

So much has happened as a result of writing this book. We have really loved delivering meet-the-author sessions in schools across the UK and seeing how excited children are by the scientists they are reading about. The book has also been a great stimulus

for the drama workshops we have led, where we bring the scientists from the book to life through a series of interactive dramatic activities. In addition, teach-meets and CPD sessions, where we explore how the book can be used in lessons, have also been really worthwhile. Teachers and school leaders have been really keen to use *Superhero Scientists* to help challenge the stereotypes in science and to develop children’s science capital (Nag Chowdhuri, King and Archer, 2021).

You can download a copy of the Katherine Johnson chapter from *Superhero Scientists* for use in your school from the ASE website: www.ase.org.uk/katherine-johnson

See more

You can see a further free chapter about another scientist, Miranda Lowe, a Museum Scientist at the Natural History Museum in London, on the Millgate House website (below).

The book is also being offered to *Primary Science* readers with 20% off, for a limited period, using the discount code **super20**. Please use the weblink below and enter the coupon code at the checkout:
www.millgatehouse.co.uk/product/superhero-scientists



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References

Archer, L., Moote, J., MacLeod, E., Francis, B. and DeWitt, J. (2020) *ASPIRES 2: Young people’s science and career aspirations, age 10–19*. London: UCL Institute of Education.

Nag Chowdhuri, M., King, H. and Archer, L. (2021) *The Primary Science Capital Teaching Approach: teacher handbook*. London: UCL Institute of Education.

SUPERHERO SCIENTISTS

By David Allen & Alex Sinclair

Illustrated by Richard Spencer

SUPERHERO SCIENTISTS

teach PRIMARY AWARDS 2021 ★★★★★

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