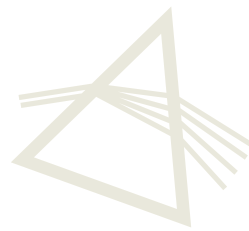




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## Research cards

# Dr Willie Hobbs Moore

Age  
7-13  
years

### About

Dr Willie Hobbs Moore was born on the 23 May 1932 in Atlantic City, New Jersey. She is remembered for being the first African-American woman to gain a PhD degree in physics.

Moore had a long career as an engineer and worked for a number of different technology companies as well as the Ford Motor Company where she introduced efficient manufacturing methods from Japan. She passed away at the age of 60 after being diagnosed with cancer. Willie Hobbs Moore is remembered as a trailblazer, whose success in her studies and work help pave the way for those who came after her.



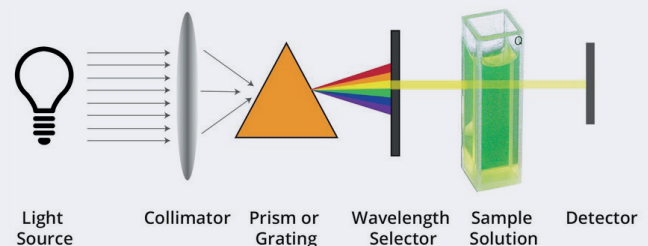
credit\_creative commons

### Working scientifically

Although Dr Moore began university studying engineering, she later became a physicist with expertise in spectroscopy. Spectroscopy is a way of learning about matter and materials by sending light through them and analysing the spectrum of light that they emit.

Moore tested many different materials for different reasons and in her tests she would make many careful measurements of the different colours of light. She would record her measurements and use them to draw graphs to look for patterns in the brightness of the different colours of light. Some materials would absorb light of certain colours and there would be gaps in their spectrum whereas some materials would emit more light of particular colours and have brighter lines in their spectrum.

Moore made discoveries about materials and wrote many articles that were published in scientific journals so that others could learn from her work. In her articles, Moore would describe methods she used in detail so others could repeat her work. She would also share the data she collected and the conclusions that she had drawn from analysing her data.

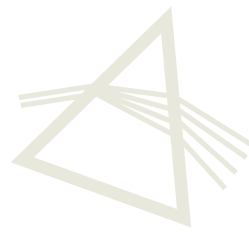


Later in her life, Moore had a change in career when she went to work as an executive for the Ford Motor Company. She researched the methods used for manufacturing cars by the Japanese motor industry and wrote a report about how they could be used to improve manufacturing in car factories in the US. Based on the research she did, Moore was able to improve the methods used in Ford factories to make cars.

Willie Hobbs Moore worked hard to support young people's STEM education in schools and universities and every Saturday she would be a tutor at a community teaching programme called the African-American Academy where she would teach maths and science to students aged 10 to 18.



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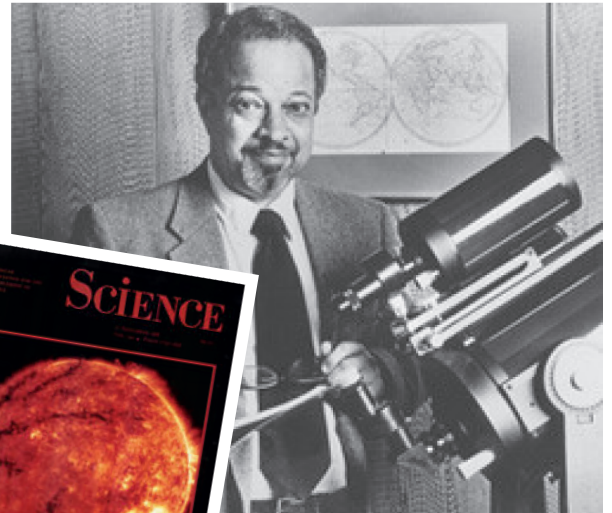
## Research cards

# Professor Arthur Walker

Age  
7-13  
years

### About

Arthur Walker was born in Cleveland, Ohio in 1936. As a boy, his family moved to New York and Walker's mother had to fight to make sure he was allowed to attend science lessons at school. As a result, he became a world-famous astrophysicist who was a pioneer in the use of x-ray and ultraviolet astronomy to study the Sun. Professor Walker died of cancer in 2001 and is remembered for the three decades of important work he did in mentoring African-American students in their PhD studies of physics.



### Working scientifically

When Arthur Walker left school, he went to university to study physics. He was so successful in his studies that he moved to another university to complete a PhD study in nuclear physics. Nuclear physics is the study of the tiny building blocks of all matter – Walker was interested in the particles that could be found in the centre of atoms and how they interacted with each other. He carried out investigations using hydrogen and helium, which have very small atoms, to carefully observe and make measurements to find out how the particles in the centre of these atoms behaved.

Walker's first job was working for the US Air Force as a second lieutenant. Here, he helped to design and build the measuring instruments to go on board a satellite that would be launched into orbit so that it could measure Van Allen belt radiation around planet Earth. Van Allen belt radiation is an area of energetic tiny particles around the planet that come from the Sun and are attracted to the Earth's magnetic field.

Fascinated by the Sun and the radiation that it was sending towards us, Walker went to work at a space

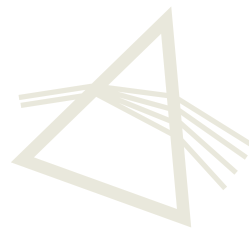
physics laboratory in California where he planned and carried out many experiments to find out more about the Sun. Many of these experiments involved making accurate measurements in the top layer of the Earth's atmosphere. Walker would measure the different types of light that came from the Sun to get a better understanding of our nearest star and the effects it has on our planet.

In 1974, Walker became a professor at Stanford University and one of his most important jobs was supervising and supporting PhD students. He would ask them about their experiments so that he could understand their plans and he would ask lots of questions to encourage them to evaluate the work they were doing. One of his first PhD students was Sally Ride who went on to be the first female astronaut to orbit Earth.

Professor Walker spent the last decade of his life leading a team who studied the Sun using special X-ray cameras that provided lots of new data to learn about our nearest star as well as some stunning images to inspire people all over the world.



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## Research cards

# Dr Neil deGrasse Tyson

Age  
7-13  
years

### About

Dr Neil deGrasse Tyson is an American astrophysicist, cosmologist and planetary scientist. Tyson was born in New York in 1958 and grew up in The Bronx where he became interested in astronomy after visiting a planetarium when he was nine years old. He has had a long career carrying out research to help develop a better understanding of the universe and is well known for being an excellent science communicator.



credit\_N

### Working scientifically

Dr Tyson carried out his first big research project when he was studying for his PhD degree at Columbia University in New York. His study was aiming to find out more about how the stars in the bulge at the centre of our galaxy were spread out. To do this he had to make careful observations using a powerful telescope in Chile. The telescope was on the top of a mountain so that there was little atmosphere for the light from the stars to travel through before arriving at the telescope, this meant that Tyson could make more detailed observations. He used a special digital camera to collect images of the stars he was observing so that they could be analysed, and he could learn more about them.

Tyson met other professors who were interested in galaxies and stars while he was carrying out his research. He shared his findings with them, and they shared their findings with him. Learning from each other helped them all get a better understanding of the observations they had made in their research. It also led to them all asking more questions that would need answering through further research.

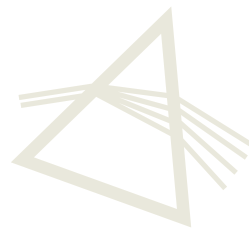
Tyson spent many years researching the life cycles of stars and galaxies while working at different universities and the American Museum of Natural History. During this time, he was also a lecturer and taught physics students about astronomy and astrophysics. Tyson learnt how to share his scientific knowledge with an audience in an exciting and interesting way.

In 1994, he began working at the Hayden Planetarium, the same planetarium that had inspired him as a young boy. While he worked there, he was in charge of a \$210 million reconstruction of the planetarium to inspire visitors for decades to come.

Tyson found other ways to share his knowledge with people so that they too would be fascinated by stars and the universe. He wrote books and articles for magazines as well as appearing on many television shows. In recent years, Tyson started his own YouTube channel called StarTalk with hundreds of videos about physics and astrophysics.



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## Research cards

# Dr Claudia Alexander

Age  
7-13  
years

### About

Dr Alexander was born in Canada in 1959. She was fascinated by physics and became a specialist in planetary science. Alexander worked for NASA for many years and was the project manager on NASA's Galileo mission to Jupiter and the Rosetta mission to study comet Churyumov-Gerasimenko. Alexander died in California in 2015 after a 10-year battle with breast cancer.



credit\_NASA



### Working scientifically

After she left school, Dr Alexander studied geophysics and space physics at the University of California. As part of her master's degree she carried out an observing over time enquiry to see how the amount of ultraviolet light in the atmosphere of Venus varied over time. Every 11 years the Sun becomes very active with lots of sunspots and solar flares and then it becomes very inactive, this is called the solar cycle. Alexander carried out her enquiry to see if there were any changes in the atmosphere of Venus that followed the same pattern as the solar cycle. The data she used for her enquiry came from a space probe in orbit around Venus called Pioneer which had many sensors on it to take measurements of the planet's atmosphere. Alexander carefully studied changes in data from the Sun and the Pioneer space probe over time and compared them to look for similarities and differences.

In 1986, Alexander went to work at NASA's Jet Propulsion Laboratory and became project manager of the Galileo spacecraft mission to explore Jupiter, taking careful observations and measurements of the planet and its moons to send back to Earth. The mission discovered 21 new moons of Jupiter and

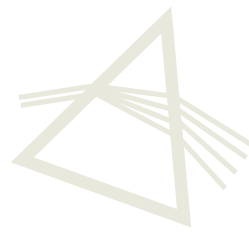
detected that Ganymede, another moon of Jupiter, had an atmosphere. At the end of its mission, the spacecraft dived into Jupiter's atmosphere to collect more data for scientists on Earth to analyse. As project manager, Alexander made sure that the mission was successful, collecting as much data as possible and sending it back to Earth for scientists to use in their enquiries, as they looked for patterns and drew conclusions.

In her last mission for NASA, Alexander was project scientist on the Rosetta mission in collaboration with the European Space Agency (ESA). The mission involved studying and landing on comet 67P/Churyumov-Gerasimenko. Alexander was responsible for three measuring instruments on the spacecraft that collected data such as temperature to send back to Earth. The mission was successful and the lander, Philae, landed on the comet in 2014 to send back the first images from the surface of a comet.

Alexander was a strong advocate for women and minorities in STEM through regular public speaking and mentoring young people to encourage their study of science.



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## Research cards

# Dr Maggie Aderin-Pocock

Age  
7-13  
years

### About

Dr Maggie Aderin-Pocock was born in London in 1968. She is a British space scientist and science educator who is well known for her role presenting the BBC television programme, *The Sky at Night*. As a child, she told her teacher that she wanted to be an astronaut, but her teacher suggested that she try nursing instead. Pursuing her interests, Aderin-Pocock has had a long career working on space science projects for industry, the government and universities.



### Working scientifically

As a student at Imperial College London, Dr Aderin-Pocock studied physics and engineering and carried out research to find out how ultra-thin films could be used in measuring equipment to make careful observations and measurements of light. She tested measuring equipment to evaluate how well it worked and made changes to improve the design so that it could make more accurate measurements. As a result of her research and investigating, Aderin-Pocock designed a really accurate measuring instrument that would be manufactured and sold to other scientists and engineers to improve the measurements they made in their investigations.

In 1997, Aderin-Pocock worked for the UK Ministry of Defence to help them develop different types of measuring and detection equipment. One of the projects that she worked on was to develop a hand-held instrument that could detect landmines. This was a very valuable tool to help people find these dangerous, hidden explosive devices and make them safe. In this job she would use her physics knowledge and engineering skills to design the instruments and then test them carefully to evaluate how well they worked. The evaluations that Aderin-Pocock made

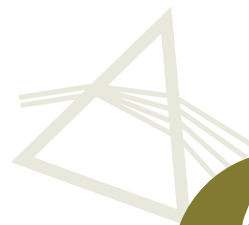
would help her and her team to make improvements so that the instrument would work better and keep people safe when doing this dangerous task.

Aderin-Pocock became lead scientist for a company called Astrium where she was responsible for the measuring equipment that would go on the satellites that they made. She helped to make measuring instruments that could measure wind speed on special satellites that were put in orbit around planet Earth to investigate climate change. The instruments that she made would make observations over time so that scientists could look for patterns in the wind speed data and use that data to develop a better understanding of climate change.

Aderin-Pocock is also an inspirational science communicator and she shares her knowledge and enthusiasm through school visits, television programmes and the books she has written. She is committed to inspiring the next generation of astronauts, engineers and scientists and making sure that young people from all backgrounds see that science is for them.



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## Research cards

# William Kamkwamba

Age  
7-13  
years



### About

Inventor and author, William Kamkwamba was born in Malawi in 1987. As a child, Kamkwamba lived in poverty and his family really struggled when a terrible famine hit the region. At this time, he had to leave school because his family couldn't afford to pay the fees but Kamkwamba was determined to keep studying. Kamkwamba was fascinated by electricity and electronics and would spend many hours studying in the local primary school library. The physics that he taught himself from those books helped him to improve the lives of his village forever.



### Working scientifically

The village in which Kamkwamba lived was very poor and there was no electricity in his home or in the village. The only source of light the villagers would have in their homes at night were smelly, smoky paraffin candles that villagers would have to walk 8km to buy. Kamkwamba had learnt that electricity could make people's lives easier and wondered whether there was a way his family could have electricity in their home to make their living conditions better.

Kamkwamba was really interested in electricity and how electric circuits worked and he read as many books as he could about the subject. Kamkwamba took apart radios to study the electric circuits inside them so that he could understand how they worked, eventually this helped him to set up his own small business repairing radios for people in his village.

After reading a book called *Using energy* in the library, Kamkwamba decided that he would try to make a simple wind turbine that could be used to generate electricity for his home. He had very little money to buy parts to construct his wind turbine so over time he collected materials that had been thrown away by local farmers or the nearby tobacco plantations and recycled them to build his turbine. He built his first wind turbine when he was 15 years old

and over the years that followed, Kamkwamba would carry out simple tests on his wind turbine and evaluate how well it worked; his evaluations led to him making many improvements such as increasing the number of blades to increase the power output. Eventually he was able to use the wind turbine to power four electric lights in his home as well as the two radios that the family owned. Kamkwamba also let his neighbours in the village charge their mobile phones using the wind turbine.

The media became very interested in Kamkwamba's amazing story and news of his accomplishments soon spread round the globe. Several people offered to pay for his secondary education so that Kamkwamba could return to school and eventually go on to university to complete his education. He has since built two more wind turbines that provide electricity for his entire village and plans to build two more. He also built a solar-powered water pump that now supplies his village with their first drinking water supply.

In 2013, *TIME* magazine named Kamkwamba one of the '30 people under 30 Changing the World'. *The Boy Who Harnessed the Wind* is available as a picture book and young readers edition and it has been made into a film.



making physics matter



Age  
7-13  
years

# Writing framework

Name .....

Research team .....

|                                                                                |                                                                                     |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Who are you researching?                                                       |    |
| Where were they from and what was/is the main area of their work/research?     |    |
| Between what years were they alive/are they still alive now?                   |    |
| What was/is most significant about their work?                                 |  |
| What working scientifically skills did the scientist(s) show in their work?    |  |
| Why was/is their work important?                                               |  |
| What other interesting facts did you discover about this person or their work? |  |
| What else would you like to know about this person or their work?              |  |