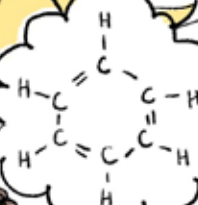
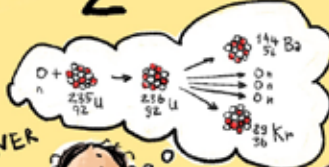


PIONEERS OF PROGRESS 2

ELIZABETH
GARRETT
ANDERSON

LISE
MEITNER

ROSA
BEDDINGTON



KATHERINE
JOHNSON

KATHLEEN
LONSDALE

EVA
CRANE

ELSIE
WIDDOWSON

BARBARA
MCLINTOCK





1908

WHAT DO
THEY WANT NEXT?
HALF OF THE
WORLD?



Pioneers of Progress II

Pioneers of Progress II continues to tell the tales of women whose contributions to scientific discovery made a huge impact on the world. Their work and scientific legacies have often gone unrecognised.

These eight women were pioneers in the truest sense of the word, and not only because of their scientific breakthroughs. Many were advocates for the education of women. All championed the proper recognition of the role of women in society, by acting as role models for those who have followed them.

These stories appear in chronological order. We begin with **Elizabeth Garrett Anderson**, who became the first woman to qualify as a physician in Britain, co-founded the first hospital staffed by women, and opened the medical profession to women. Physicist **Lise Meitner** contributed to the discovery of the element protactinium and of nuclear fission. She declined an offer to work on the Manhattan Project, and was described by her nephew as “a physicist who never lost her humanity”. American geneticist **Barbara McClintock** was awarded the 1983 Nobel Prize in Physiology and Medicine. Her research focused on developing ways to visualise and characterise maize chromosomes. She discovered transposons and understood their role in evolution and genome change well before others. The crystallographer and prison reformer **Kathleen Lonsdale** was one of the first two women elected to the Royal Society (along with Marjory Stephenson). Lonsdaleite, an allotrope of carbon and a rare form of diamond formed when meteorites strike the Earth, was named after her. The nutritionist **Elsie Widdowson**, older sister to Eva Crane, studied chemistry at Imperial College. She oversaw the addition of vitamins to food during rationing in Britain in World War II. **Eva Crane**, born Ethel Eva Widdowson and younger sister of Elsie, became one of the greatest writers on bees and beekeeping of the 20th century, though her original subjects were mathematics and quantum mechanics. **Katherine Johnson** was an American mathematician whose calculations of the mechanics of orbits as a NASA scientist were key to the success of crewed spaceflights. She earned a reputation for complex manual calculations and helped to pioneer the use of computers. She was one of the first African-American woman to work as a NASA scientist, and her life is the subject of the 2016 film *Hidden Figures*. The career of British biologist **Rosa Beddington** had a major impact on developmental biology and the understanding of the fate of cells in the early embryo.

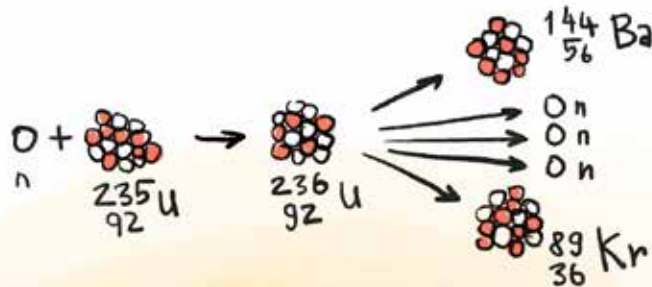
Pioneers of Progress Book II is the second in a series that follows **Heroes of Health**, a comic book that describes how the Medical Research Council began, more than 100 years ago. It tells the stories of some of the ground-breaking discoveries that have transformed the way we all live. We hope you enjoy this book.

For more information contact:

Dr Jenna Stevens-Smith and Dr Sophie Arthur
Grants, Engagement and Communications (GECO) Facility
MRC London Institute of Medical Sciences, London W12 0NN
geco@lms.mrc.ac.uk

LISE MEITNER

AND 48 NOBEL PRIZE SUGGESTIONS



LIFE NEED NOT
BE EASY, PROVIDED
ONLY IT IS NOT
EMPTY



1890, VIENNA

WHAT SHALL I DO
WITH YOU, WUTZERL?
YOU'VE GREAT MARKS
IN SCIENCE BUT YOUR
HAND WRITING IS
REALLY AWFUL!

IT DOESN'T MATTER.
I WANT TO STUDY
MATHEMATICS AND
PHYSICS.

WHILE I AGREE
THAT ALL MY DAUGHTERS
SHOULD HAVE AN
EDUCATION, I HAVE TO
SAY THAT I THINK
TEACHING FRENCH
WOULD BE MUCH MORE
SUITABLE FOR YOU.



1906, UNIVERSITY OF VIENNA

WHAT WILL YOU DO
WITH YOUR DOCTORATE,
BECOME A TEACHER?

NO, I WANT TO GO
TO BERLIN AND
STUDY WITH
MAX PLANCK.



1926. BERLIN



SINCE CHADWICK PROVED
THE EXISTENCE OF THE
NEUTRON WE SHOULD DO
SOME TRANSURANIUM
RESEARCH TO CREATE
HEAVIER ELEMENTS
THAN URANIUM.

I GUESS
WE HAVE
TO HURRY UP.

BUT RUTHERFORD,
JOLIOT-CURIE AND
FERMI ARE ALSO
ON TO IT.

OTTO HAHN

PARIS



IRENE JOLIOT-CURIE

CAMBRIDGE



ERNEST RUTHERFORD

ROME



ENRICO FERMI

1933

ISN'T IT BECOMING
TOO DANGEROUS HERE
FOR YOU? THEY ALREADY
TOOK AWAY YOUR TEACHING
AUTHORITY. MANY JEWISH
COLLEAGUES LEFT GERMANY
ALREADY.

NONSENSE! I AM PROTECTED
BY MY AUSTRIAN CITIZENSHIP.
WE HAVE IMPORTANT WORK
TO DO AND BESIDES: WHO
ELSE COULD EXPLAIN THE
RESULTS OF OUR EXPERIMENTS?
YOU ARE A BRILLIANT
CHEMIST HAHNCHEN. BUT YOU
DON'T UNDERSTAND PHYSICS.





DECEMBER 1938 . IN A SWEDISH FOREST

HAHN IS BAFFLED BY THE UNUSUAL RESULTS OF THE EXPERIMENTS. WHEN THEY BOMBARDED THE URANIUM WITH NEUTRONS THEY DIDN'T GET HEAVIER ELEMENTS, BUT LIGHTER ONES: BARIUM AND KRYPTON. ALSO SEVERAL NEUTRONS AND LARGE AMOUNTS OF ENERGY WERE RELEASED.

ASTONISHING!

OTTO ROBERT FRISCH

IF WE USE $E=mc^2$ THE RELEASED ENERGY CAN BE EXPLAINED BY THE CONVERSION OF REST MASS INTO KINETIC ENERGY.

LET'S CALL IT NUCLEAR FISSION!

1942, LOS ALAMOS

WOULD YOU LIKE
TO COME AND WORK
ON OUR PROJECT TO
FIND OUT HOW AN ATOMIC
EXPLOSION CAN BE
GENERATED?

SWEDEN

NO THANKS.
I WANT NOTHING
TO DO WITH A
BOMB!



1945, NOBEL PRIZE AWARD CEREMONY



SURELY HAHN FULLY DESERVED
THE NOBEL PRIZE FOR CHEMISTRY..
BUT I BELIEVE THAT OTTO
ROBERT FRISCH AND I CONTRIBUTED
NOT INSIGNIFICANTLY TO CLARIFYING
THE PROCESS OF URANIUM FISSION.



Acknowledgements and thanks

These illustrated tales were researched and written by Kirstin von Glasow with assistance from Susan Watts.

The beautiful illustrations are by Elina Ellis.

Thanks also to Professor Dame Amanda Fisher for initiating and developing the Heroes for Health and Pioneers of Progress books.

Pioneers of Progress: Tales of Women in Science was designed and produced by the Grants, Engagement and Communications Facility at the MRC London Institute of Medical Sciences, and funded by the Medical Research Council (MRC), part of UK Research and Innovation (UKRI).

For more information contact:

Dr Jenna Stevens-Smith and Dr Sophie Arthur
Grants, Engagement and Communications (GEC) Facility
MRC London Institute of Medical Sciences, London W12 0NN
geco@lms.mrc.ac.uk



2020

WHAT ARE
THEY ON ABOUT?
THEY ALREADY
HAVE THE VOTE!



