Anne McLaren

1927-2007

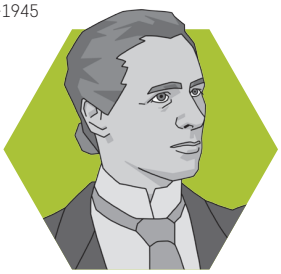
Known for **mouse genetics**

Fame	62
Impact	77
Nobel Prizes	0
Number of Children	3
Special Power (ethics)	18

McLaren's studies of mice and other mammals revealed that the external environment influences an embryo's gene expression during development, which paved the way for *in vitro* fertilisation and fertility treatment in humans.

Edith Saunders

1865-1945



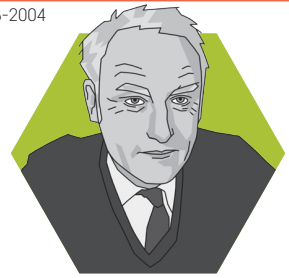
Known for **plant genetics**

Fame	41
Impact	28
Nobel Prizes	0
Number of Children	0
Special Power (vigour)	30

With William Bateson and Reginald Punnett, Saunders confirmed Mendel's results but also showed that inheritance of combinations like flower colour and pollen shape would break Mendel's laws, now known to be due to genetic linkage.

Francis Crick

1916-2004



Known for **the double helix**

Fame	99
Impact	93
Nobel Prizes	1
Number of Children	3
Special Power (communication)	3

Working with James Watson and inspired by Rosalind Franklin's X-ray images, Crick built the double-helix structure of DNA. He also proposed the central dogma of molecular biology: information cannot flow from proteins to genes.

Frederick Sanger

1918-2013

Known for **DNA sequencing**

Fame	82
Impact	92
Nobel Prizes	2
Number of Children	3
Special Power (boating)	1

One of only four scientists with two Nobels, Sanger won his first for methods that identify amino acids in proteins and shared his second with Walter Gilbert for reading the sequence of nucleotide letters in DNA.

Mary Lyon

1925-2014

Known for **X-chromosome inactivation**

Fame	63
Impact	81
Nobel Prizes	0
Number of Children	0
Special Power (rigour)	22

Lyon helped explain why women who only 'carry' a genetic disorder can exhibit symptoms. She proposed that in female mammals, one of the two X chromosomes is randomly silenced during early development, a process dubbed 'Lyonisation'.

Paul Nurse

1949-

Known for **the cell cycle**

Fame	74
Impact	92
Nobel Prizes	1
Number of Children	2
Special Power (astronomy)	7

After Leland Hartwell identified the gene that controls when yeast cells can enter a growth phase during the cell-division cycle, Nurse discovered the gene controlling whether cells can pass a checkpoint before they divide in two.

Ronald Fisher

1890-1962

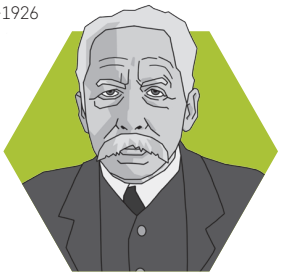
Known for **population genetics**

Fame	87
Impact	94
Nobel Prizes	0
Number of Children	8
Special Power (eccentricity)	2

A genius in statistics, Fisher incorporated Mendel's concept of heredity into Charles Darwin's theory of natural selection. With fellow population geneticists JBS Haldane and Sewall Wright, he developed the modern evolutionary synthesis.

William Bateson

1861-1926



Known for **Mendelian genetics**

Fame	70
Impact	50
Nobel Prizes	0
Number of Children	3
Special Power (feminism)	20

Bateson was an early champion of Mendelian principles. After Mendel's research from 1865 was rediscovered in 1900, he coined the term 'genetics' for the study of heredity and, with Edith Saunders, founded the Genetics Society.

William Hamilton

1936-2000

Known for **kin selection**

Fame	74
Impact	98
Nobel Prizes	0
Number of Children	3
Special Power (curiosity)	11

Hamilton showed that natural selection can still favour costly social behaviours like altruism if it helps relatives (kin) as they share the same genes, a theory of evolutionary fitness made famous by Richard Dawkins' book *The Selfish Gene*.

Charlotte Auerbach

1899-1994

Known for **chemical mutagenesis**

Fame	68
Impact	50
Nobel Prizes	0
Number of Children	0
Special Power (teaching)	28

After Hermann Muller had shown that radiation can generate mutations in fruit flies, Auerbach and JM Robson showed that mustard gas could also alter genes, revealing that chemical mutagens can affect genes too.

Christiane Nüsslein-Volhard

1942-

Known for **embryonic development**

Fame	69
Impact	88
Nobel Prizes	1
Number of Children	0
Special Power (philanthropy)	12

By creating mutant insects and comparing their abnormal features, Nüsslein-Volhard and Eric Wieschaus identified key genes that control the number and orientation of segments in the body of a fruit-fly embryo.

Elizabeth Blackburn

1948-

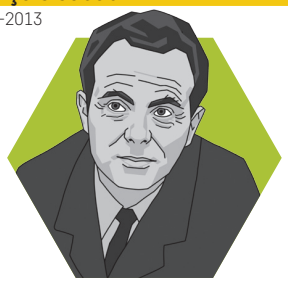
Known for **telomeres**

Fame	82
Impact	96
Nobel Prizes	1
Number of Children	1
Special Power (mentoring)	8

Blackburn and Jack Szostak discovered DNA sequences called telomeres that cap the ends of chromosomes to protect the genetic material. With Carol Greider, she then identified the enzyme that builds those telomeres.

François Jacob

1920-2013



Known for **gene regulation**

Fame	68
Impact	79
Nobel Prizes	1
Number of Children	4
Special Power (philosophy)	6

Jacob and Jacques Monod's work on *E. coli* showed that genetic switches control the production of proteins using instructions from DNA, which involved copying that information as an intermediate now known as 'messenger RNA'.

Gregor Mendel

1822-1884

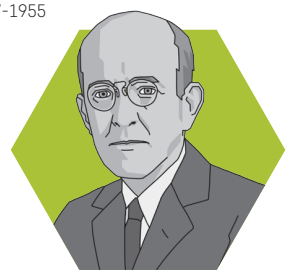
Known for **the laws of inheritance**

Fame	100
Impact	32
Nobel Prizes	0
Number of Children	0
Special Power (perseverance)	25

Mendel's breeding experiments with pea plants showed that characteristics such as flower colour and seed shape are inherited according to specific laws and determined by unseen factors, units of heredity now called 'genes'.

Oswald Avery

1877-1955



Known for **the genetic material**

Fame	80
Impact	56
Nobel Prizes	0
Number of Children	0
Special Power (eloquence)	23

Together with Colin MacLeod and Maclyn McCarty, Avery's experiments isolated the material that enabled Pneumococcus bacteria to inherit virulent features, which suggested that genes are made of that material, the molecule DNA.

Sydney Brenner

1927-2019

Known for **organ development**

Fame	77
Impact	89
Nobel Prizes	1
Number of Children	3
Special Power (mischief)	4

Brenner followed the effects of mutations on the development of nematode worms to reveal how cells divide and differentiate to form various organs, which John Sulston and Robert Horvitz later showed requires programmed cell death.

Tomoko Ohta

1933-

Known for **nearly-neutral evolution**

Fame	57
Impact	80
Nobel Prizes	0
Number of Children	1
Special Power (persuasiveness)	21

After Motoo Kimura had suggested that mutations which are neither good nor bad will spread by chance, Ohta's theory of molecular evolution revealed how mildly harmful 'nearly neutral' mutations can persist in a population's gene pool.

Tsuneko Okazaki

1933-

Known for **DNA replication**

Fame	52
Impact	59
Nobel Prizes	0
Number of Children	2
Special Power (resilience)	24

One strand in the double helix cannot be copied continuously during replication so cells will combine pieces of DNA, short sequences of nucleotides discovered by Tsuneko and her husband Reiji that are now called 'Okazaki fragments'.

Barbara McClintock

1902-1992

Known for **mobile genetic elements**

Fame	91
Impact	78
Nobel Prizes	1
Number of Children	0
Special Power (independence)	10

McClintock discovered transposable elements or 'jumping genes' in maize (corn) that can move around chromosomes. With Harriet Creighton, she also observed that genes are exchanged by chromosomal crossover during the process of meiosis.

Esther Lederberg

1922-2006

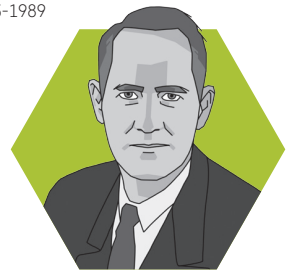
Known for **bacterial genetics**

Fame	71
Impact	52
Nobel Prizes	0
Number of Children	0
Special Power (music)	27

Lederberg discovered lambda phage, a virus that infects *E. coli*, and the 'Fertility factor' that many bacteria need for sexual reproduction. She also invented techniques that helped her first husband Joshua win a Nobel prize.

George Beadle

1903-1989



Known for **one gene - one enzyme**

Fame	69
Impact	60
Nobel Prizes	1
Number of Children	1
Special Power (climbing)	15

Beadle and Edward Tatum exposed bread mould to X-rays and found that genetic mutations alter the enzyme that catalyses a particular biochemical reaction, which suggested that each gene encodes the instructions for making one enzyme.

Janet Rowley

1925-2013

Known for **cancer genetics**

Fame	61
Impact	86
Nobel Prizes	0
Number of Children	4
Special Power (cycling)	13

Rowley showed that cancer is a genetic disease by observing the movement or 'translocation' of DNA between two chromosomes in patients with leukaemia, a discovery that enabled the development of chemotherapy drugs.

Jennifer Doudna

1964-

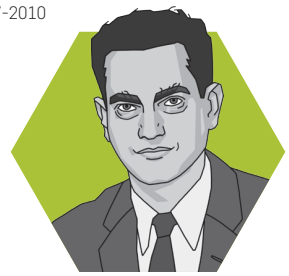
Known for **CRISPR gene editing**

Fame	71
Impact	98
Nobel Prizes	0
Number of Children	1
Special Power (gardening)	17

Doudna and Emmanuelle Charpentier modified a bacterial defence system that uses a genetic sequence called 'CRISPR' to guide the enzyme Cas9 to cut viral DNA, creating a gene-editing tool that can target specific DNA sequences.

Marshall Nirenberg

1927-2010



Known for **the genetic code**

Fame	69
Impact	72
Nobel Prizes	1
Number of Children	0
Special Power (precision)	14

Nirenberg helped crack the genetic code that translates instructions encoded in DNA to the language of proteins. With Heinrich Matthaei, he deciphered the first 'codon' to demonstrate that each of DNA's code words is three letters long.

Mary-Claire King

1946-

Known for **human genetics**

Fame	74
Impact	86
Nobel Prizes	0
Number of Children	1
Special Power (activism)	19

King isolated *BRCA1* and *BRCA2*, genes that normally suppress tumours but can cause breast cancer when mutated. With Allan Wilson, she also showed that amino acid sequences in humans and chimpanzees are 99% identical.

Nettie Stevens

1861-1912

Known for **sex determination**

Fame	74
Impact	32
Nobel Prizes	0
Number of Children	0
Special Power (creativity)	29

Stevens discovered that sex is determined by chromosomes after observing that mealworm eggs fertilised by sperm carrying a large X chromosome produced female beetles, whereas sperm that delivered a small Y created male offspring.

Phillip Sharp

1944-

Known for **split genes**

Fame	64
Impact	100
Nobel Prizes	1
Number of Children	3
Special Power (farming)	5

Sharp and Richard Roberts revealed that genes are not always a continuous DNA sequence but are split into segments that can be spliced together in alternative combinations, which means a single gene can encode multiple different proteins.

Ruth Sager

1918-1997

Known for **extranuclear inheritance**

Fame	56
Impact	74
Nobel Prizes	0
Number of Children	0
Special Power (enthusiasm)	26

Before a career in cancer research, Sager showed that antibiotic resistance in green algae was not inherited via chromosomes inside the cell nucleus, which suggested that genes are also present in chloroplasts within the cytoplasm.

Seymour Benzer

1921-2007

Known for **behavioural genetics**

Fame	71
Impact	81
Nobel Prizes	0
Number of Children	3
Special Power (reinvention)	16

Benzer's work on viruses showed that genes have a linear structure. The former physicist also found that the circadian rhythm of fruit flies is controlled by the clock gene *period*, proving that mutations can influence behaviour.

Thomas Morgan

1866-1945

Known for **chromosomes**

Fame	81
Impact	58
Nobel Prizes	1
Number of Children	4
Special Power (generosity)	9

Morgan noticed that mutations which changed eye colour in fruit flies matched the pattern of inheritance for sex chromosomes, leading him to conclude that chromosomes are the physical structures that carry genes.

HOW TO PLAY

GENETICIST TRUMPS is a game for 2-6 players. Here are the instructions:

1. Shuffle the 30 playing cards in the deck then deal them face down. Each player holds their stack so they can only see the uppermost card.

2. One player (conventionally left of the dealer) starts by choosing and reading one of the categories and its value, such as "Fame: 100." Each player reads-out the value on their uppermost card before putting it in a central pile.

3. The player whose card beats or 'trumps' the others then adds the entire pile to the bottom of their hand. If there is a tie between two or more players, values for the same category are read from subsequent cards (also placed in the centre) until one has the highest value.

4. The winner of a round chooses the category for the next round. The player who ends-up with all of the cards wins the game!

CATEGORIES

Fame: a measure of renown based on the geneticist's online popularity

Impact: rate at which the scientist's published research has been cited

Nobel Prizes: number of prestigious awards won for major scientific advances

Number of Children: amount of offspring that inherited the person's genes

Special Power: a characteristic or hobby that reflects their personality

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GLOSSARY

Amino acids: the building blocks of proteins. **Chromosomes**: structures made mostly of DNA that carry genes. **DNA**: deoxyribonucleic acid, a long molecule that stores genetic information. **DNA replication**: process of making a copy of the molecule. **Double helix**: the twisted ladder-like structure of DNA. **Gene**: unit of heredity with instructions for producing a protein or other functional product. **Gene expression**: process of executing the instructions encoded by a gene. **Gene pool**: set of all genetic variants (alleles) in a population. **Genetic linkage**: tendency for genes to be inherited together when they are near one another on a chromosome. **Enzymes**: proteins that work as catalysts in biochemical reactions. **Heredity**: transmission of features from parents to offspring. **Meiosis**: a kind of cell division that splits pairs of similar chromosomes to reduce the number of sets. **Mutagen**: something that can cause mutations, including radiation, chemicals or biological factors (such as viruses). **Mutant**: an organism or feature that results from mutation. **Mutations**: heritable changes to DNA. **Nucleotides**: the building blocks of DNA/RNA. **Proteins**: large molecules that perform functions or make up organisms. **RNA**: ribonucleic acid, often a sequence copied from DNA. **Sequence**: a continuous series of nucleotides along a DNA/RNA molecule.

100 YEARS the geneticssociety 1919 - 2019

GENETICIST TRUMPS

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Find out more about the scientists featured in GENETICIST TRUMPS by scanning the Quick Response code on the right. Here's how to scan a QR code from your phone or tablet:

1. Open the default Camera app and make sure that the whole QR square is visible on your device's touchscreen.
2. **Android devices**: tap 'More' then 'Lens' followed by search. **Apple iPhone or iPad**: a notification will automatically appear.
3. Tap the link in the pop-up box. You can choose to share your location to tell us where you scanned this card.

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**Who are the world's most famous geneticists?
Have they won a Nobel prize?
What are their special powers?
Find out with GENETICIST TRUMPS!**

This card game features 30 of history's greatest geneticists and explains how they changed our understanding of genes and heredity. Play against your family, friends and academic rivals by comparing values for stats like fame or impact. Discover the top trumps in each category as you try to win all the cards!

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