OpenUp Science

CAMBRIDGE SCIENCE CENTRE

In this issue, we're thinking about Deoxyribonucleic Acid aka DNA

Find out more with the fun activities and puzzles inside!

What is DNA?

Origami DNA

Genetics and Genomes

This issue was kindly supported by:

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Welcome to OpenUpScience from Cambridge Science Centre.

This issue is to celebrate DNA day on 25th April.

What is DNA?

DNA is the 'nickname' given to Deoxyribonucleic Acid. It's a set of instructions used by your body to make you, you!

It determines the colour of your hair, whether you are right-handed or left-handed, how you grow and even how things taste to you.

So where is it found?

Well, your body is made up of trillions of cells. These cells are the building blocks of our bodies. Almost all cells contain a nucleus - this is like the brain of the cell. If we look more closely inside the nucleus, we can see odd looking structures - these are called chromosomes.

Did you know..?

Animals have different number of chromosomes.

A bear has 76 chromosomes

An elephant has 56 chromosomes

A gorilla has 48 chromosomes

A kangaroo has 16 chromosomes

Humans have 46 chromosomes - 23 from each parent.

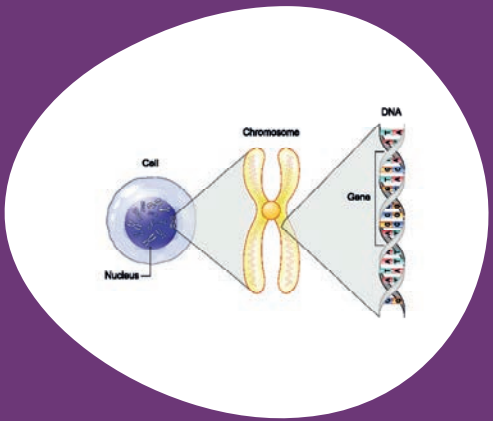
Chromosomes are made up of four types of nucleotides or bases, which always pair up in the same way:

Adenine (A) pairs with Thymine (T)

Cytosine (C) pairs with Guanine (G)

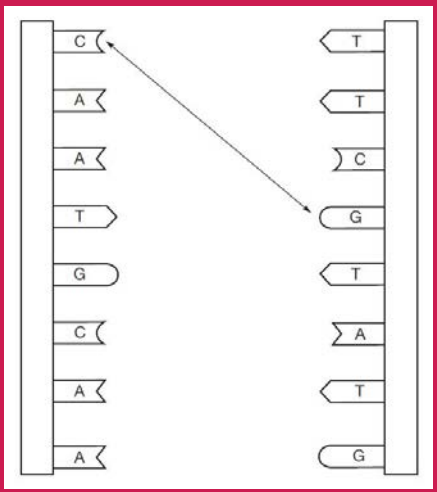
These pairs are repeated over and over again in each strand of DNA .

Human DNA contains about 3 billion pairs!



Match each base with its corresponding pair.

(Hint: A always matches with T's , C's always match with G's)



DNA was first discovered in 1869 by **Johann Fredrich Miescher.** He found a substance that he called 'nuclein' (because he thought it came from the cell nucleus) but, unbeknown to him, he had worked out the molecular basis of life - DNA.

In 1952 **Rosalind Franklin** took a photograph showing a distinctive helical shape pattern in the nucleus. This photo was shared with **James Watson and Francis Crick,** leading them to uncover the double helix structure of DNA in 1953. Their discovery gave rise to modern molecular biology.

Make Your Own Origami DNA

Each piece of DNA has two long strands, or chains. The two strands are joined together. They form a shape that looks a bit like a ladder that has been twisted into spiral called a helix.

Cut out the DNA chain on the page opposite and fold it to make you r own DNA helix.

What to Do

1. Fold in half lengthways. Make the creases as firm as possible.

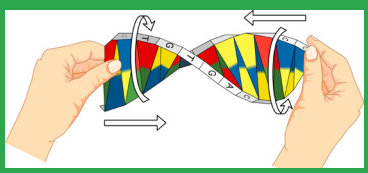
2. Hold the paper so that the thick lines are diagonal and the thin. lines horizontal. Fold the top segment down and then unfold.

3. Repeat for all the segments.

4 Turn the paper over. Make the creases as firm as possible.

5. Fold along the first diagonal line.and then and unfold. Repeat for all diagonal lines.

6. Fold the white edge without letters up. Fold the other edge away from you. Partly unfold both edges.



7. Twist and turn the paper while pushing the ends towards each other. Be brave!

8. Now let go! and admire your DNA double helix!

Origami model: Alex Bateman, Thoki Yenn

C
C
T
C
G
T
C
A
C
A
C
G
A
G
C
T
G
T
G
T

STEM IS MY SUPERPOWER

We share 99.9% of our genes, but there is no one like **YOU!.**
Use your imagination to design a lab coat as unique as you are.

Activity Provided by:

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DNA Wordsearch

Can you find all the words?

Z	J	L	G	S	L	N	N	I	F	V	L
Y	E	M	L	A	U	U	N	N	N	F	A
M	D	L	D	C	N	H	H	S	X	N	U
I	E	Z	L	N	E	D	S	T	B	H	D
C	J	E	G	R	S	D	T	R	V	Y	I
E	U	Q	I	N	U	I	I	U	F	H	V
S	M	T	U	E	G	I	A	C	Q	E	I
J	E	P	B	C	X	G	R	T	E	C	D
D	L	I	V	I	N	G	T	I	Y	S	N
B	I	O	L	O	G	Y	K	O	T	O	I
A	O	V	S	C	I	T	E	N	E	G	U
V	U	X	C	K	P	L	H	S	T	Y	U

INHERITED
GENETICS
DNA
BIOLOGY

TRAITS
CELLS
LIVING
INSTRUCTIONS

NUCLEUS
UNIQUE
INDIVIDUAL
YOU

What things make you, you that aren't entirely genetic (for example skills, hobbies and likes)?

Genetics and Genomics

Scientists call the small sections or blocks of the DNA string, genes. Genetics is the study of genes and how these genes will make you the way you are.

We can think of cells, chromosomes, DNA and nucleotides as being like the parts of a cookbook.

Chromosomes are like the recipes for the seen and unseen things that make us - hair colour, left or right handed, freckles etc.

The strands of **DNA** and the **neucleotides** provide the instructions of how to put together the proteins that make up your body.

DNA or not?

Which of these things contain DNA?

 yes / no

 yes / no

 yes / no

 yes / no

 yes / no

Genomes

Your complete set of DNA is called a genome. Almost every cell in your body contains a complete copy of the genome. Genomics is the study of how the genes within the genome interact with each other and the environment.

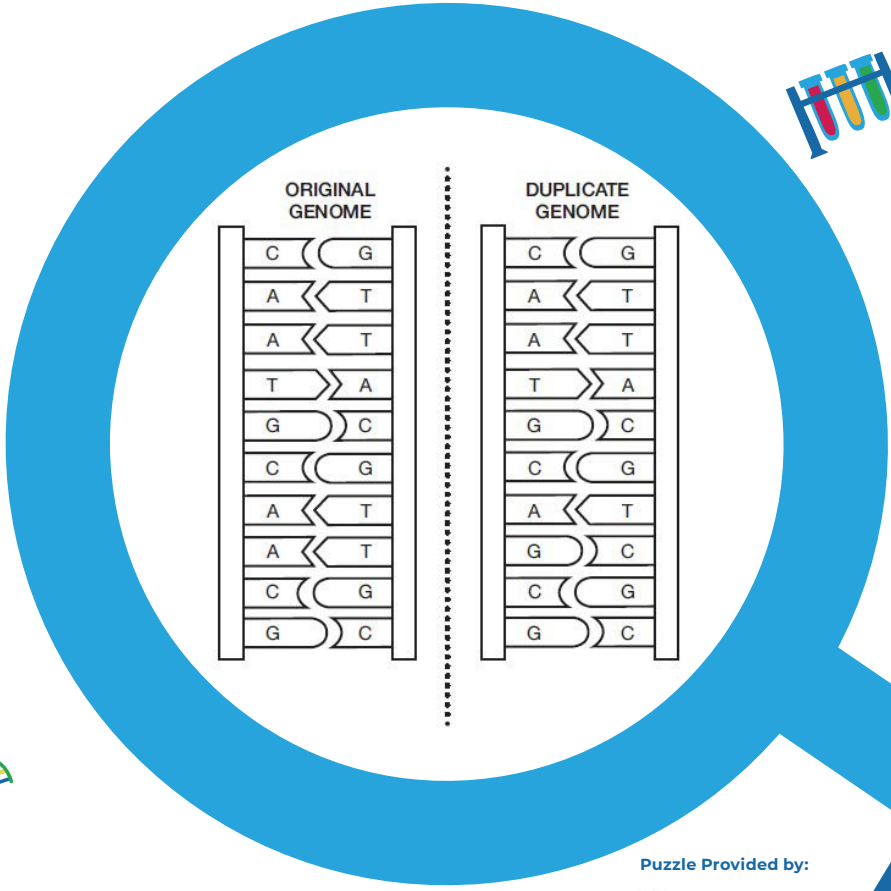
Did you know..?

99.9% of your DNA is shared with your best friend. It's incredible that such a small amount can make us all so different.

Variant Genome

Find the variant genome that is not like the others.

Hint: A variant is a mutation or change in the genome.



Puzzle Provided by:

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Did you know..?

Six billion nucleotides or bases make up the human genome. Almost every cell in your body contains a copy of the genome. If you took all the DNA from all of the cells in your body and stretched it out, it would reach to the sun and back 300 times!

Emoji Genetics

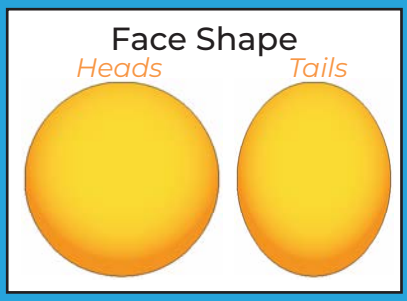
Using simple emoji features such as face and mouth shape, we can look at how features are randomly inherited and passed on to the next generation.

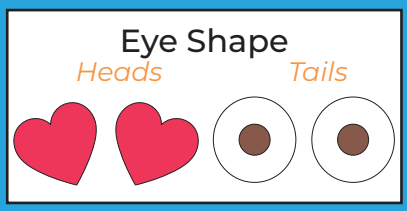
What you'll need

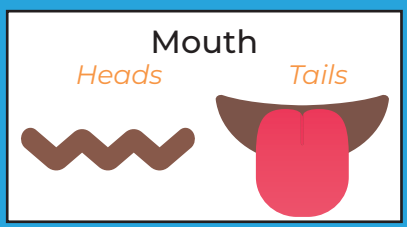
- A coin
- Paper
- Colouring pencils
- This page!

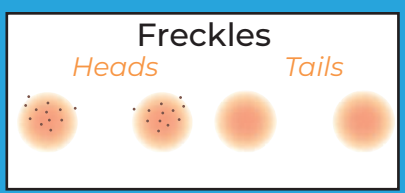
What to Do

1. Start with the face shape. Flip the coin. If it lands on heads, draw a round face shape on your paper and if it lands on tails, draw an oval shaped face.
2. Flip the coin 4 more times to work through the other traits and build your emoji.







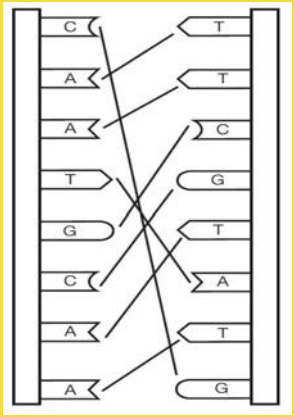


Puzzle Solutions

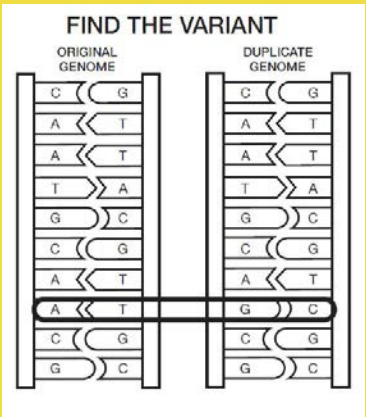
Wordsearch

Z	J	L	G	S	L	N	N	I	F	V	L
Y	E	M	L	A	U	U	N	N	N	F	A
M	D	L	D	C	N	H	H	S	X	N	U
I	E	Z	L	N	E	D	S	T	B	H	D
C	J	E	G	R	S	D	T	R	V	Y	I
E	U	Q	I	N	U	I	I	U	F	H	V
S	M	T	U	E	G	I	A	C	Q	E	I
J	E	P	B	C	X	G	R	T	E	C	D
D	L	I	V	I	N	G	T	I	Y	S	N
B	I	O	L	O	G	Y	K	O	T	O	I
A	O	V	S	C	I	T	E	N	E	G	U
V	U	X	C	K	P	L	H	S	T	Y	U

Match the base pairs



DNA or not?



Did you know..?

By studying genomes in living things, we can find out where we come from, how animals have evolved, help farmers grow more nutritious food and help solve crimes.

This Spring, and throughout 2023, Cambridge Science Centre will be working with the Illumina Corporate Foundation to celebrate National DNA Day, the 20th anniversary of the Human Genome Project and the 70th anniversary of the discovery of the DNA double helix.

Take a look at our website to see where we're popping up near you and all of the exciting things we do!

Staying in Touch
Please get in touch if you have any questions. We'd love to hear from you.

Email:
openupscience@cambridgesciencecentre.org

Website:
cambridgesciencecentre.org

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