

LMCB

Medical Research Council
Laboratory for Molecular Cell Biology

Who are we?

We are
160
staff and
students



We are from
42
different
countries

67 of us have UK nationality
68 of us have European
nationality
48 of us have non-European
nationality



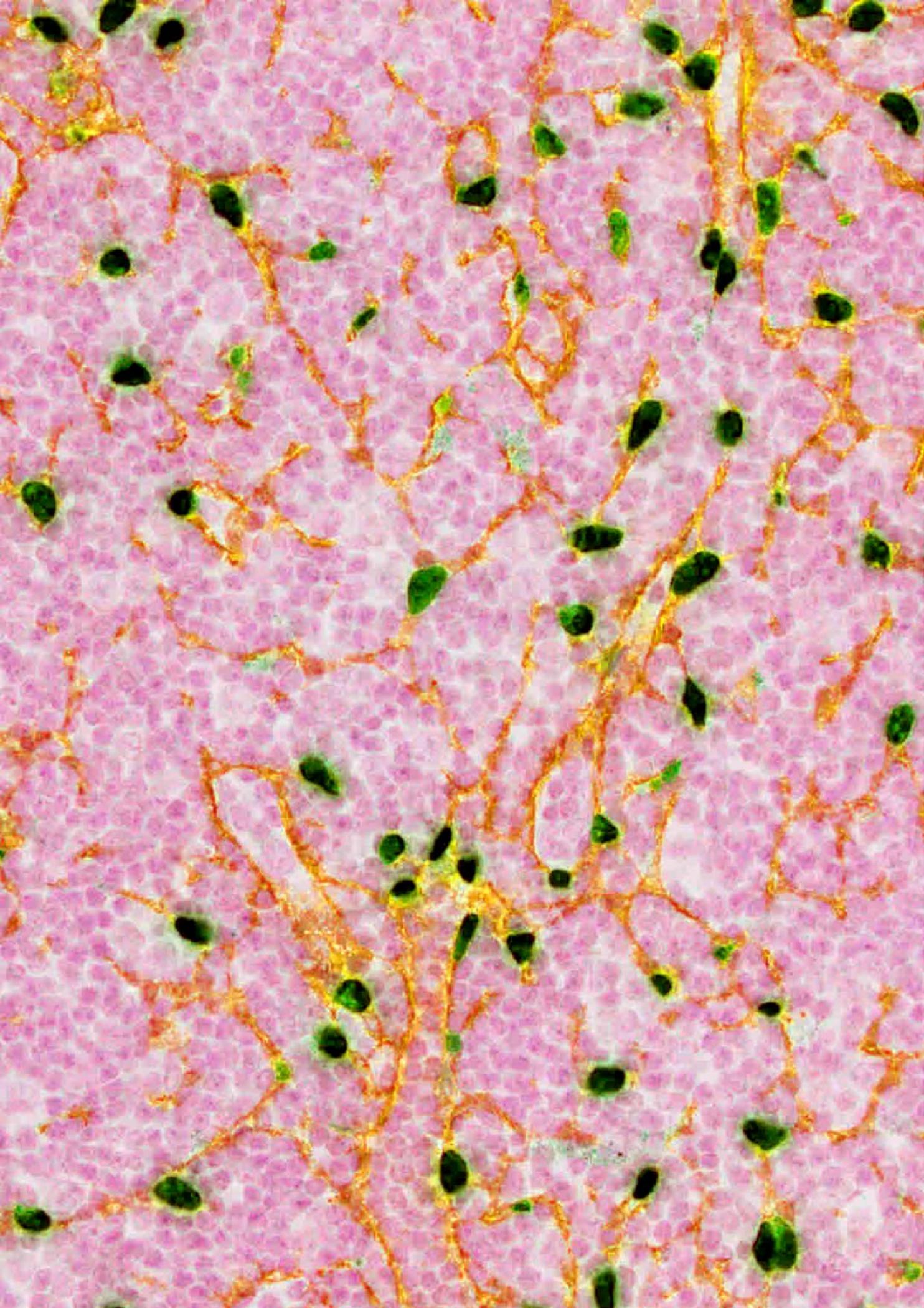
We are
26
years old

We have
18
research
groups

We study over
18
different
diseases

We have
published over
1200
research articles

We have over
70
microscopes
(and one is partly made with LEGO!)



Meet a scientist!



Ricardo Henriques leads the Henriques Lab. He was born in a small fishing village in Portugal. When he was **seven** he played with LEGO and computer games. He uses Maths and Physics to study cells. Sometimes he explodes things in the lab!



Susanna Bidgood is a research scientist in the Mercer Lab. She was born in Oxford, UK. When she was seven, she wanted to become a **postman** so she could ride her bike everywhere! She studies how the Vaccinia Virus attacks the immune defense of human cells. The Virus is 350 x 250 x 250 nm (which is very small!). She uses **Electron Microscopes** and **Super-Resolution Microscopes** to see it. Sometimes she explodes cells to release the viruses inside them!



Yanlan Mao leads the Mao Lab. She was born in China. When she was **seven** she loved to study Maths! She combines Maths and Biology to understand how the size and shape of tissues is controlled. She uses many different kinds of microscopes to look at very small tissues in fruit flies.



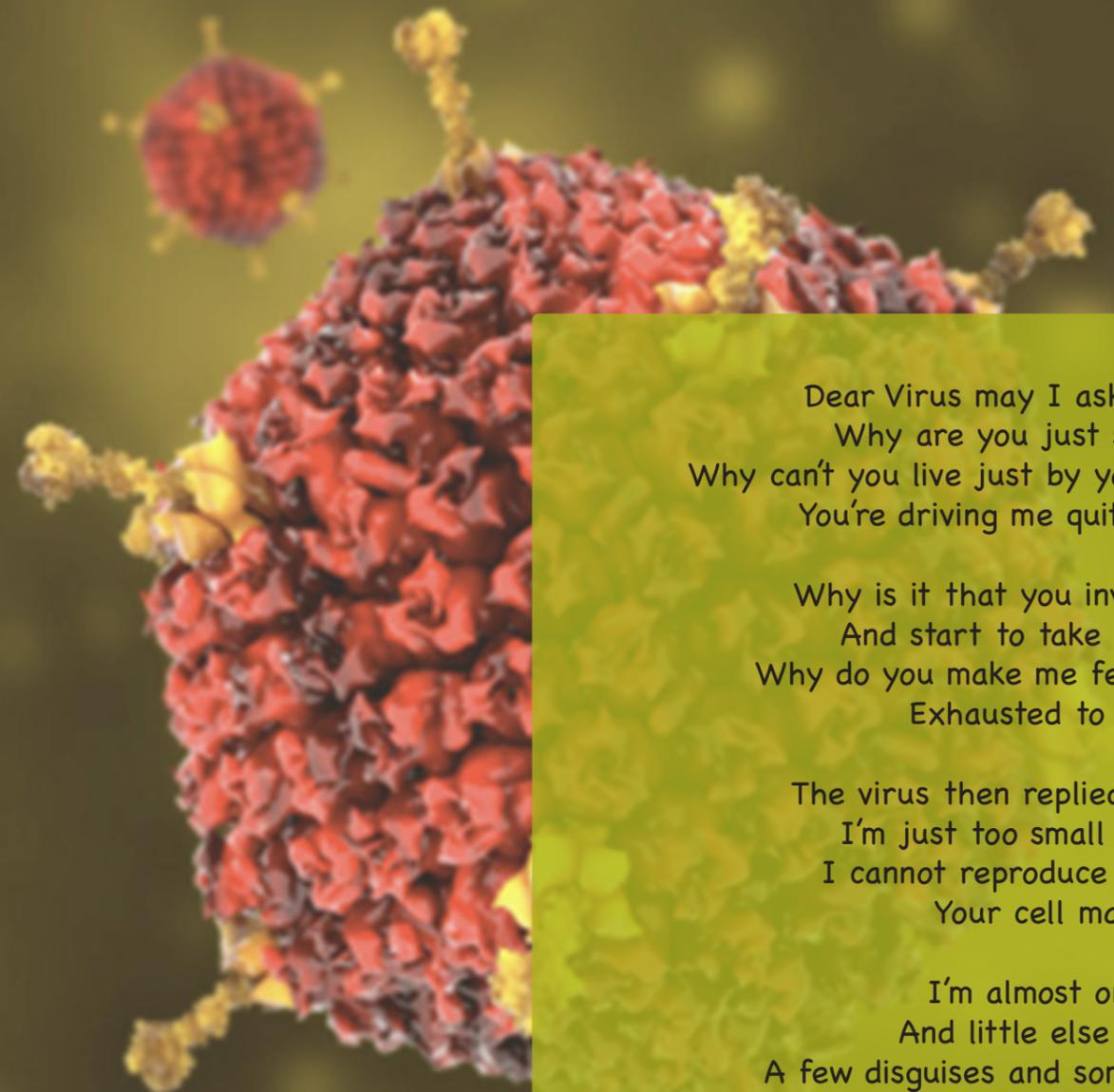
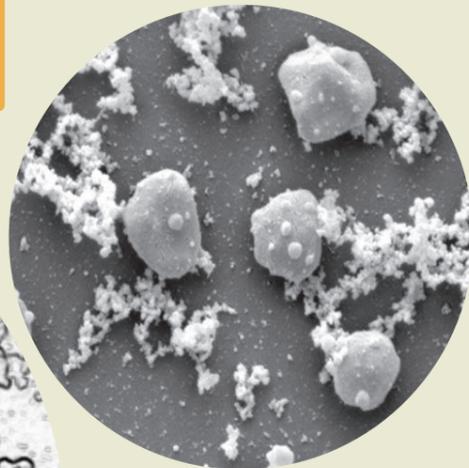
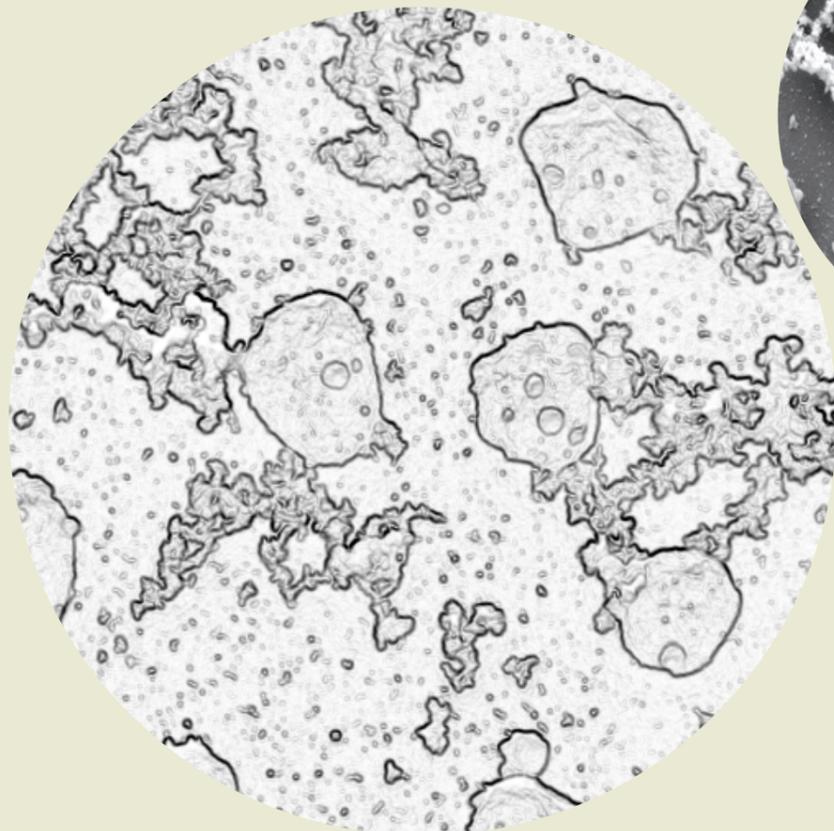
Gautam Dey is a research scientist in the Baum Lab. He has lived in Cyprus, India, Switzerland, USA and the UK. When he was **seven** he played with **LEGO** and spied on **ant colonies!** He is studying how complex cells evolved the ability to divide - and a micron-sized (very small!) microorganism found in hot springs holds all the clues! He doesn't explode things in lab, but he is trying to heat up a very sophisticated microscope to above **70C**.

Colour me in!

Chromosomes



Archaea



Adenovirus

Conversations with a virus

Dear Virus may I ask of you
Why are you just so lazy?
Why can't you live just by yourself?
You're driving me quite crazy

Why is it that you invade me
And start to take control?
Why do you make me feel so ill
Exhausted to my soul

The virus then replied to me:
I'm just too small you see
I cannot reproduce without
Your cell machinery

I'm almost only DNA
And little else besides
A few disguises and some tools
To get in your insides

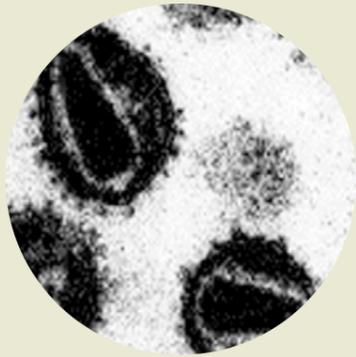
I'm squatting here just for a while
To replicate myself
I do not mean to make you ill
Or endanger your health

Besides I'll have to leave quite soon
Before you kill me off
Your immune system's closing in
Please give a little cough!

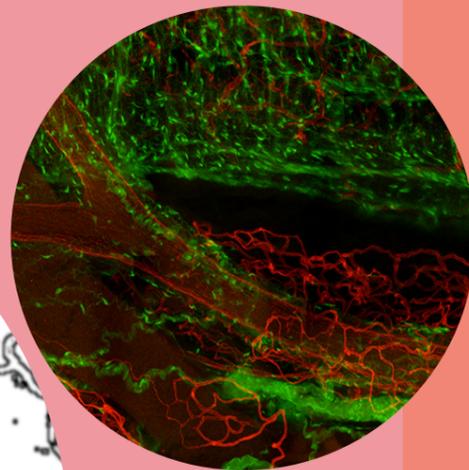
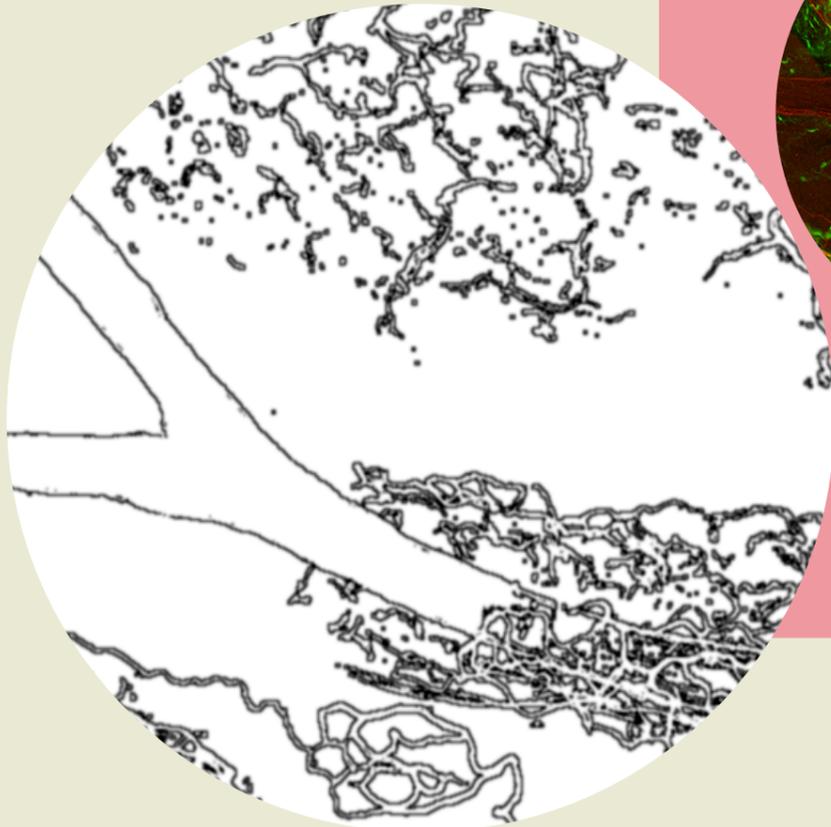
There's someone new just over there
I'd quite like to infect
Now there are millions of me
We're ready to Eject!
.....Aaaaaaccchhhhhooooo!

Colour me in!

HIV



Blood vessels



Take the science QUIZ!

Which unit belongs to which quantity?

- | | |
|------------------|---------------|
| 1. Mass | A. Gram |
| 2. Volume | B. Millimolar |
| 3. Concentration | C. Piconewton |
| 4. Force | D. Nanometre |
| 5. Length | E. Microlitre |



How is your blood type determined?

- Genetically determined from parents
- During birth
- Environmental factors throughout life
- All of the above

How many cells are there in your body?

Approximately ...

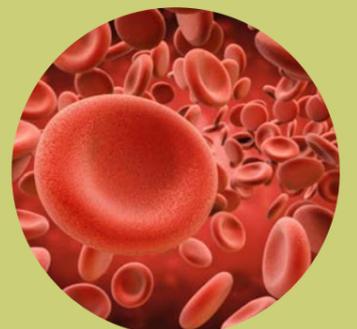
- 60 thousand
- 50 million
- 40 trillion
- 30 gazillion

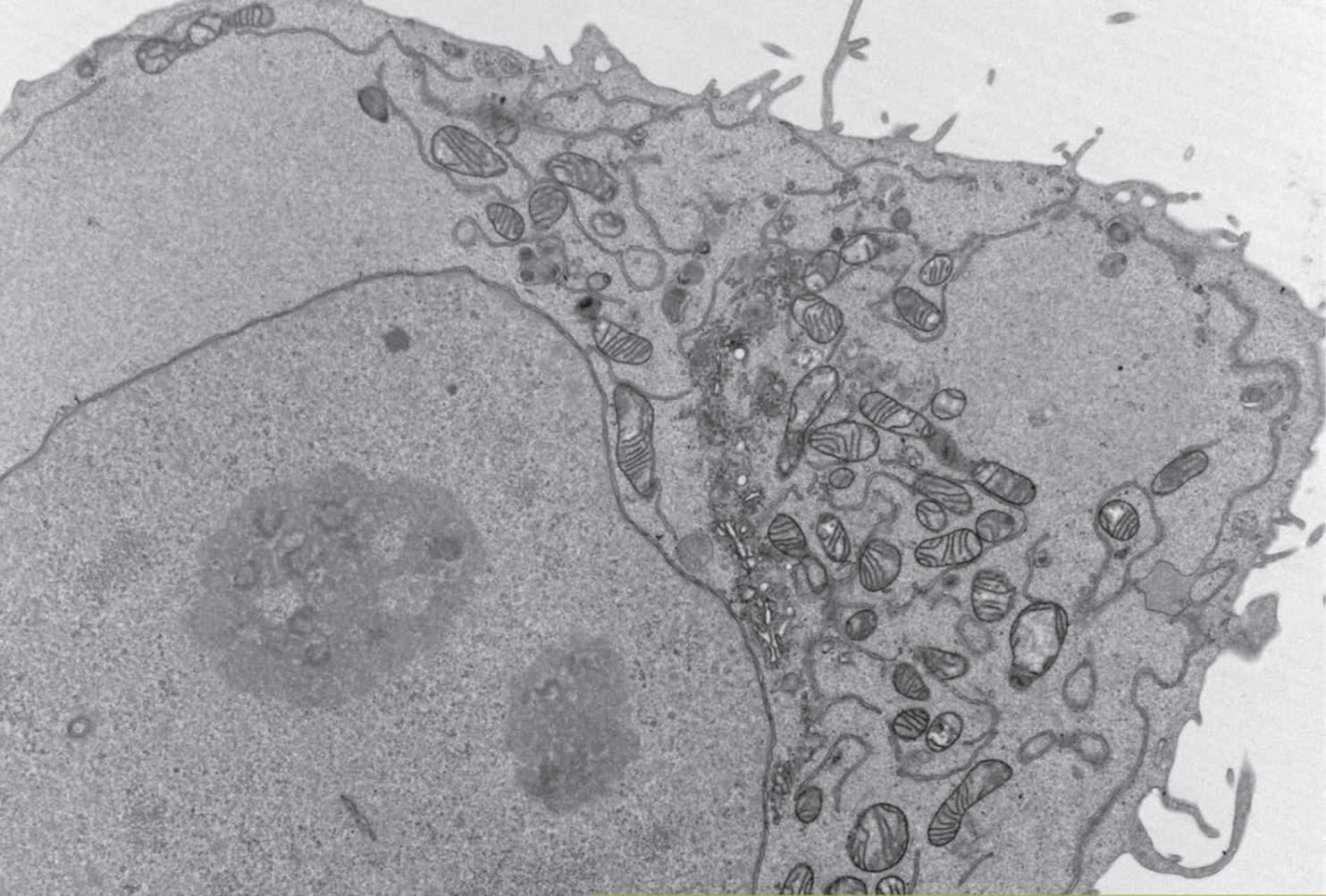
Dry ice is a form of which gas?

- Helium
- Nitrogen
- Carbon dioxide
- Hydrogen



What is the main function of red blood cells?



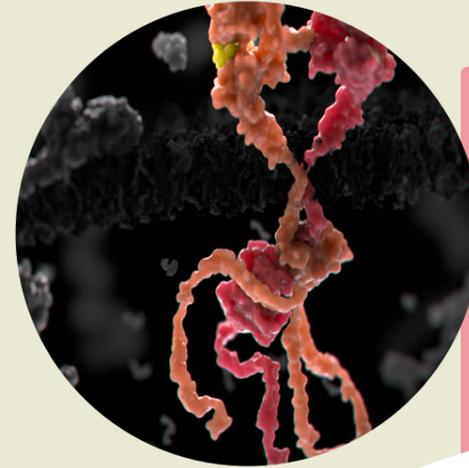


Cell

The busy cell

The cell's a complex bag of stuff
 It has ER both smooth and rough
 A nucleus with DNA
 To tell the cell to be that way
 There's endosomes and lysosomes
 In cytosol they make their homes
 And mitochondria don't forget
 And Golgi apparatus yet
 All this and still too small to see
 Our minute cell biology
 (Unless you have a microscope
 In which case you've a better hope)

Colour me in!

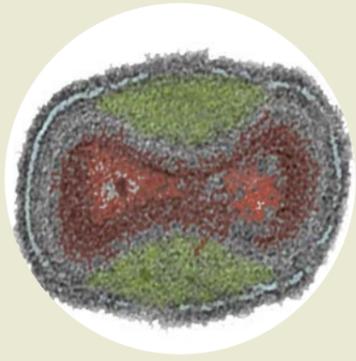


kinase

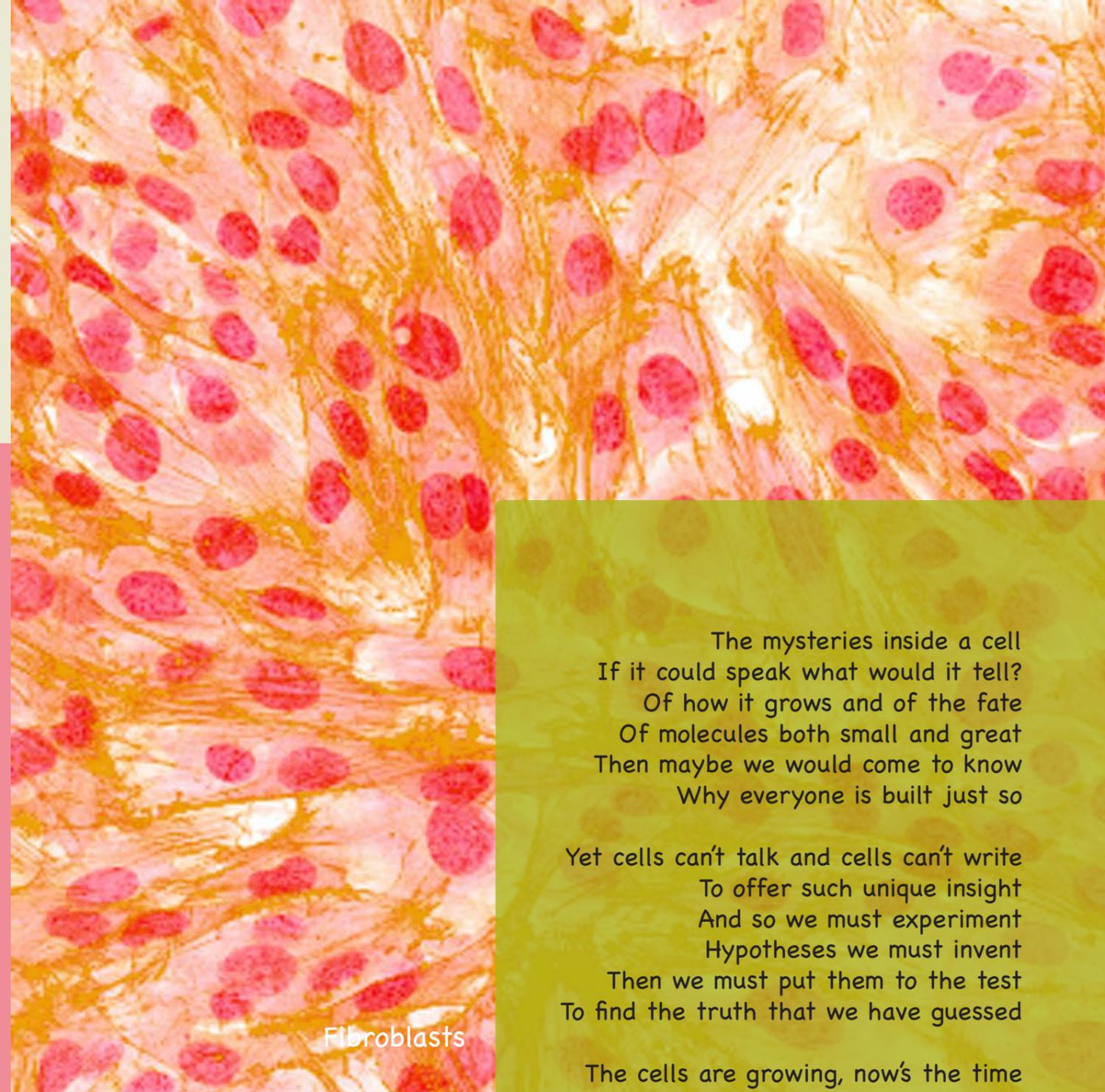
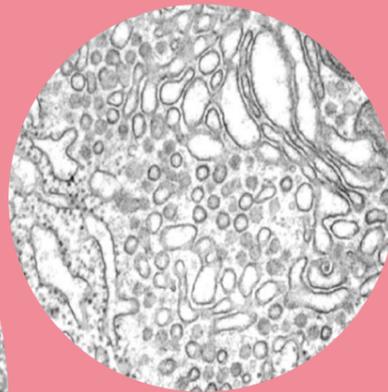
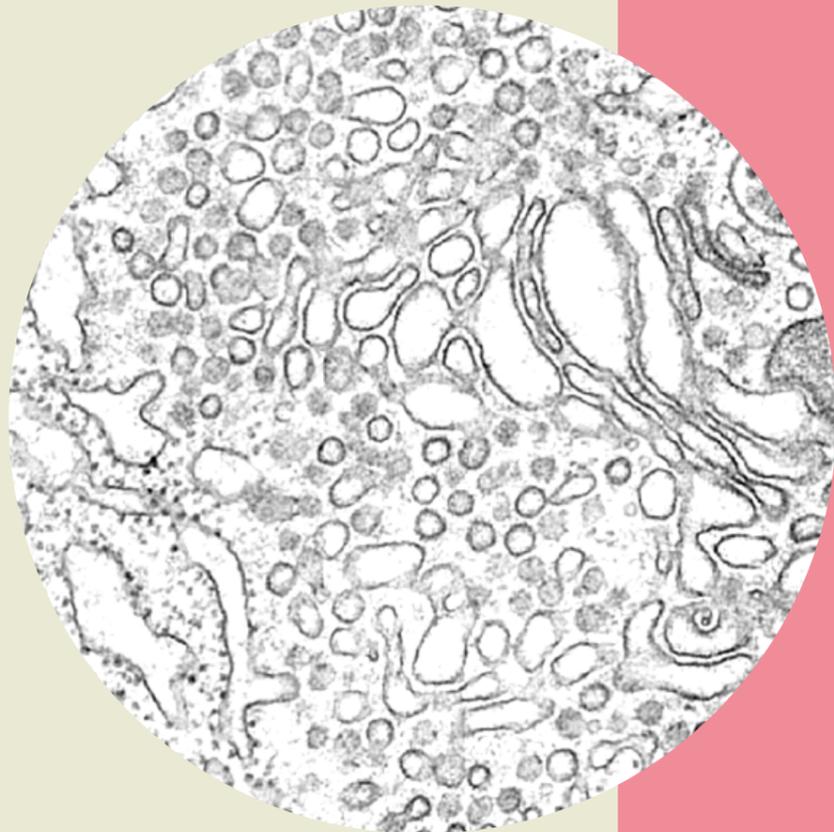


Colour me in!

Vaccinia



Secretory vesicles



Fibroblasts

The Quest

The mysteries inside a cell
If it could speak what would it tell?
Of how it grows and of the fate
Of molecules both small and great
Then maybe we would come to know
Why everyone is built just so

Yet cells can't talk and cells can't write
To offer such unique insight
And so we must experiment
Hypotheses we must invent
Then we must put them to the test
To find the truth that we have guessed

The cells are growing, now's the time
To test experiment design
We mutate genes or with drugs treat
We stimulate them and complete
Such observations that we see
With powerful microscopy

We probe we label and we spin
We work until results come in
Then discuss them with helpful friends
Our quest for knowledge never ends
And when we're sure as sure can be
We publish work for all to see

Take the science QUIZ!

Colour me in!

Which can you see with your naked eye?

- organ
- protein
- cell

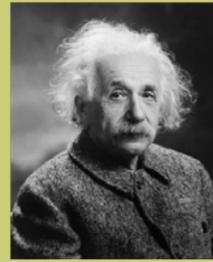
Who developed the polio vaccine?



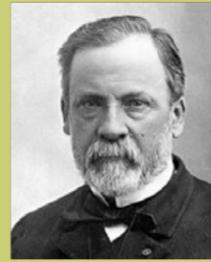
Marie Curie



Jonas Salk



Albert Einstein



Louis Pasteur

Which of these cells in your body contain DNA?

- skin cells
- neurons
- red blood cells
- heart muscle cells
- white blood cells



Which is colder?

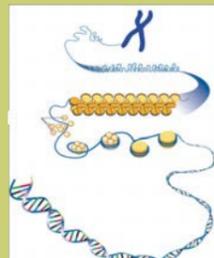


liquid nitrogen



dry ice

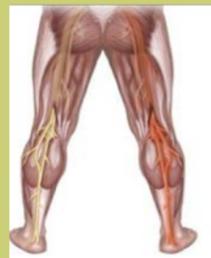
Arrange elements of your body from longest to shortest



DNA

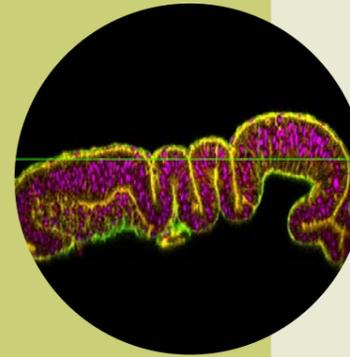


intestine



sciatic nerve

wing disc



Fruit fly



Take the science QUIZ!

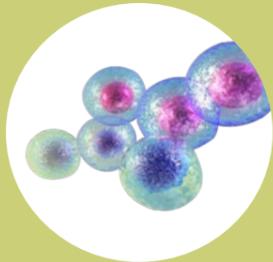
Which mineral forms the lead in a pencil?

- quartz
- graphite
- lead
- calcite

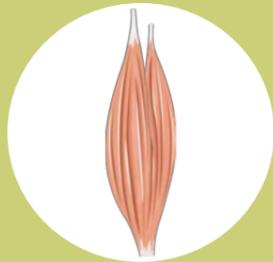


Which is heavier?

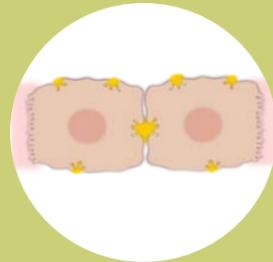
- 100kg of iron
- 100kg of sand
- 100 litres of water



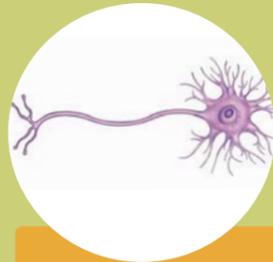
stem cells



muscle cells



liver cells



nerve cells

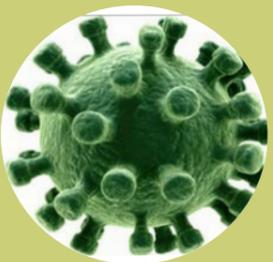
How are stem cells different to other cells?



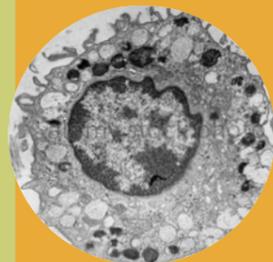
bacterium



parasite



virus



cell

Order the above from largest to smallest

When you are sick and take antibiotics, which do they kill?

Caron Jacobs, LMCB PhD student

The pipette slinger

The scientist stood in the lab
Pipette in hand she stood
Approached the bench and she began
Believe me, she was good!

Her hands a blur, her mind at peace
Poetry in motion
Accurately formulating
Such a perfect potion

And when she finished finally
She danced a perfect "dab"
She really had the skills she was
The fastest in the lab



Images

Chromosomes - DNA is packaged into chromosomes. Fruit flies only have four chromosomes compared to 23 in humans, which makes studying fly genetics much easier! The Baum, Pichaud and Mao Labs use fruit flies to understand how cells change during development. (Fluorescence microscopy)

Archaea - Archaea are microbes that can be found in many extreme environments around the world, including the hydrothermal vents at Yellowstone National Park! These Archaea like to live at 80°C. Many of the features of complex cells, such as the ones found in humans, likely originate from an ancient archaeal host. The Baum Lab use archaea to understand the evolution of cell division from microbes to humans. (Electron microscopy)

Blood vessels - Blood vessels transport blood throughout the human body. The Lloyd Lab study how blood vessels and neurons interact during wound healing regeneration. (Confocal microscopy)

HIV - Someone infected with the human immunodeficiency virus (HIV) will eventually develop acquired immunodeficiency syndrome (AIDS). HIV infects cells of the immune system. The Marsh Lab studies HIV and related viruses to understand how viruses enter host cells. (Electron microscopy)

Kinase - Enzymes carry out reactions inside cells. A kinase is an enzyme that changes the properties of a molecule. Kinases play many important roles in the body and can be targeted by drugs to treat diseases. In the High Content Biology Laboratory, the Ketteler Lab identifies potential therapeutic targets in diseases such as cancer and neurodegeneration. (Cartoon)

Cell - This image was been taken by an electron microscope. You can see the nucleus in the middle, which contains the cell's DNA. Surrounding the nucleus is the cytoplasm. It contains lots of organelles which carry out important jobs in the cell. (Electron microscopy)

Adenovirus - The common cold is an example of an infection caused by adenoviruses. Viruses cannot live and make new viruses without a host. The Marsh and Mercer Labs study how viruses hijack cells to make more viruses. (Cartoon)

Vaccinia - The Vaccinia Virus was the first vaccine ever to be used. It was used to eradicate smallpox, which is estimated to have killed 300-500 million people throughout history. Scientists think that Vaccinia originally came from cows but nobody is completely sure! The Mercer Lab uses Vaccinia Virus to investigate how viruses and host cells interact during infection. (Electron microscopy)

Secretory vesicles - Secretory vesicles are sacks found inside cells. They carry cargo such as hormones or neurotransmitters to the outside of the cell. The Gissen Lab studies ARC syndrome, where this transport process is defective. (Electron microscopy)

Wing disc - The wing disc is the part of a larva that will become a wing in the adult fruit fly. The Mao Lab use wing discs to understand how mechanical forces affect tissue growth and regeneration. (Confocal microscopy)

Fibroblasts - Fibroblast cells are important for maintaining the structure of tissues and also play a role in the immune system. The Acton lab studies interactions between fibroblasts and immune cells inside the lymph node. (Confocal microscopy)

Photoreceptors - Photoreceptor cells register light entering the eye and allow the fruitfly to see. These cells need to be the correct shape to work properly. The Pichaud Lab uses photoreceptors to study how cells grow and maintain their shape. (Confocal microscopy)

Fruit fly - Fruit flies and humans share many fundamental biological features. Flies are easy to work with and have a short life cycle, which makes them good model organisms. The Mao Lab use fruit flies to understand how mechanical forces affect tissue growth and regeneration. (Photograph)

Quiz answers

Mass/Gram, Volume/Microlitre, Length/Nanometer, Concentration/Millimolar, Force/Piconewton

Blood is genetically inherited from parents

You can only see organs by eye, you need a light microscope to see cells and an electronic microscope to see a protein!

There are 40 trillion cells in a human body

Blood cells carry oxygen throughout the body

Stem cells generate many different types of cells

Jonas Salk developed the polio vaccine

Skin cells, neurons, heart muscle cells, and white blood cells all contain DNA

The intestine is 6 metres long, DNA is 2 metres long, the sciatic nerve is 1 metre long

Graphite forms the lead in a pencil

Antibiotics kill bacteria very efficiently, but they can be toxic and kill other cells if you take too many!

Dry ice is a form of carbon dioxide

100 litres of water weigh 100 kilograms! 100 kilograms of weight is the same no matter what they are made of

Liquid nitrogen is -196°C, dry ice is -78°C

Parasite > Cells > Bacteria > Virus



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