## Biture <br> The Cell

The world inside us: Uncovering the secrets of the cell

We all share something amazing in common - that we developed from a single sperm and egg to become complicated, sophisticated organisms, made of trillions of cells. But what are these cells like and how do they vary from one tissue to another? The diagram below
gives a flavour of the complex make-up of a typical animal cell. The stages of the cell cycle - how the cell divides - are shown around the outside. At the bottom explore some of our cells' vital statistics: from size to speed, number to lifespan.
cytoskeleton
microtubules - small, tubular assemblies of protein, made from repeating tubulin subunits, which help maintain the cell's internal structure and cytoplasm using molecular motors
microfilaments - smaller than microtubules, these are made from repeating actin subunits. Responsible for cell movement and changes in shape, and make muscle contraction possible
vacuoles - internal bags, vacuoles - internal bags, which cells use for storage of food or waste
centrioles - a pair of organelles that organises microtubules into spindles on which chromosomes are separated when cells divide
cytoplasm - everything in the cell outside the nucleus; a viscous fluid containing proteins, other organic and inorganic molecules, membranes and organelles
Golgi apparatus - one of the wondrously complex membrane systems in the cytoplasm, which modifies,
packages and directs newly made proteins to where they are needed
plasma membrane a phospholipid bilayer that contains cholesterol and proteins. It surrounds the cell and enables it to communicate with its neighbours and detect in the environment
mitochondria (singular mitochondrion) - rodshaped bodies in the cytoplasm that supply chemical energy to the rest of the cell


## How small is small?

Along a 1 cm line, you could fit ...around 1800 sperm heads ..around 1300 red blood cells around 80 egg cells
large it cannot take in food molecules
or export waste fast enough to function rexport waste fast tenough to function
propery. The lower limiti is the size needed o enclose the nucleus, the organelles and enough cytoplasm for molecules to pass

What's the smallest cell in the body?
Human sperm are often thought of as
he smallest, but granule cells, a type of
micrometres across -a bits smaller than the
head of a typical sperm, which measures
 $5-6$ micrometres in length.

How fast are proteins made
A single polypeptide can be made on a ribosome in 20 seconds. Larger proteins may take several minutes.
How fast do nerve impulses travel? A typical fast nerve impulse, like the one you use when you pul your hand away from a
fire, travels down a cell fibre at 100 metres per second (over 223 mph.).

## ysosomes - membrane

 bound organelles that are the cell's rubbish disposal and recycling units; contain hydrolytic enzymesextracellular matrix the material in between cells that holds tissues together, proteins such as collagen
nucleus - the information centre of the eukaryotic cell where the DNA is stored, replicated and copied into RNA (transcribed)
nuclear envelope double membrane that of the nucleus from the cytoplasm
nuclear pores - gaps in the nuclear envelope that allow substances to move and out of the nucleus
nucleolus - part of the nucleus that produces ribosomes
endoplasmic reticulum (ER) - an extensive network is studded with ribosomes and is a site where proteins are made, modified and processed for shipping. The roles of smooth ER include lipid and steroid synthes and drug detoxificatio
ribosomes - molecular machines, built from RNA and protein, that make new proteins. They are found in the cytoplasm and bound reticulum

Think you know your cells? Take a look at some of their vital statistics. when the components of the cell are being copied and the final stage (mitosis) when the nucleus spilits and the cell then divides into two new cells. In an actively dividing human cell, mitosis takes about an hour, and the
rest of the cycle averages another 23 hours.

What's the shortest-living cell?

bacteria are gone in less than a day
The cells in the lining of the small intestine live for a few days.

What's the longest-living cell? The neurons in y yhole liftime.
How often do different cells divide? The fastent-do dividing human cells are in The fastest-dividing human cells are in
the skin and the lining of the intestine they produce a new generation in less than a day (around 20 hours). Neurons
do not normally divide at all.

## Number

Humans have diferent types of cell? of cell. There are many 200 different types ells in the immune system where antibo producing cells are the same type but each one produces a single kind of one the millions of possible antibody proteins, with a specific shape. Other cell types hav less elaborate subdivisions.

How many bacterial cells in/on me? Humans are home to many bacteria, which ive in the digestive system and on the surface of the body. The total bacterial population has perhaps ten times as
many cells as there are body cells - that is, 1000 trillion - though they are much smaller. They wigh around 1 kg altogethe


An average adult has trilions (millions of millions) of cells. Estimates vary, but the average is around 100 trillion.

## in a lifetime?

As lifetime? As cell lifetimes vary, we can make only replaces cells every seven to ten years, so we might use up ten or so sets of cell in 70 years, for a total of 1000 trillion.
Which is the most common cell?
The most common cell type is the red blood cell, which accounts for roughly a quarter of all the body's cells

Size
What's the biggest cell in the body? The egg or ovum is usually said to be the spine, a kind of specialist neuron on the fron part of the nerve channel inside the spinal cord, is 135 micrometres across - a little larger than the ovum, which averages around 120 micrometres.

## What limits size?

The surface area of a cell increases more

## Speed

- How fast do organelles move?
When pulled along by the cytoskeleton,
they cover about 5 micrometres per second.
- What is the fastest cell?
A cell such as a white elood cell, which uses
its internal cytoskeleton to crawl along, can
manage speeds of micrometres per minute.
Cells with powerful flagella tom ove them
along, such as sperm, go
as master - up to
as a few millilimetres per minute.

