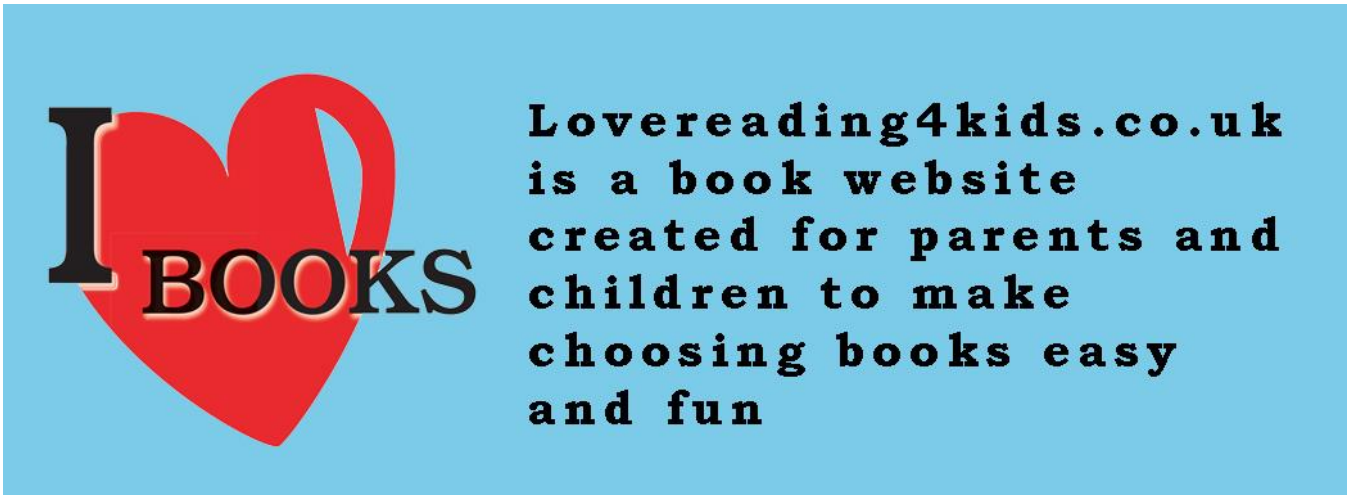

Opening extract from

Stuff You Should Know About the Human Body

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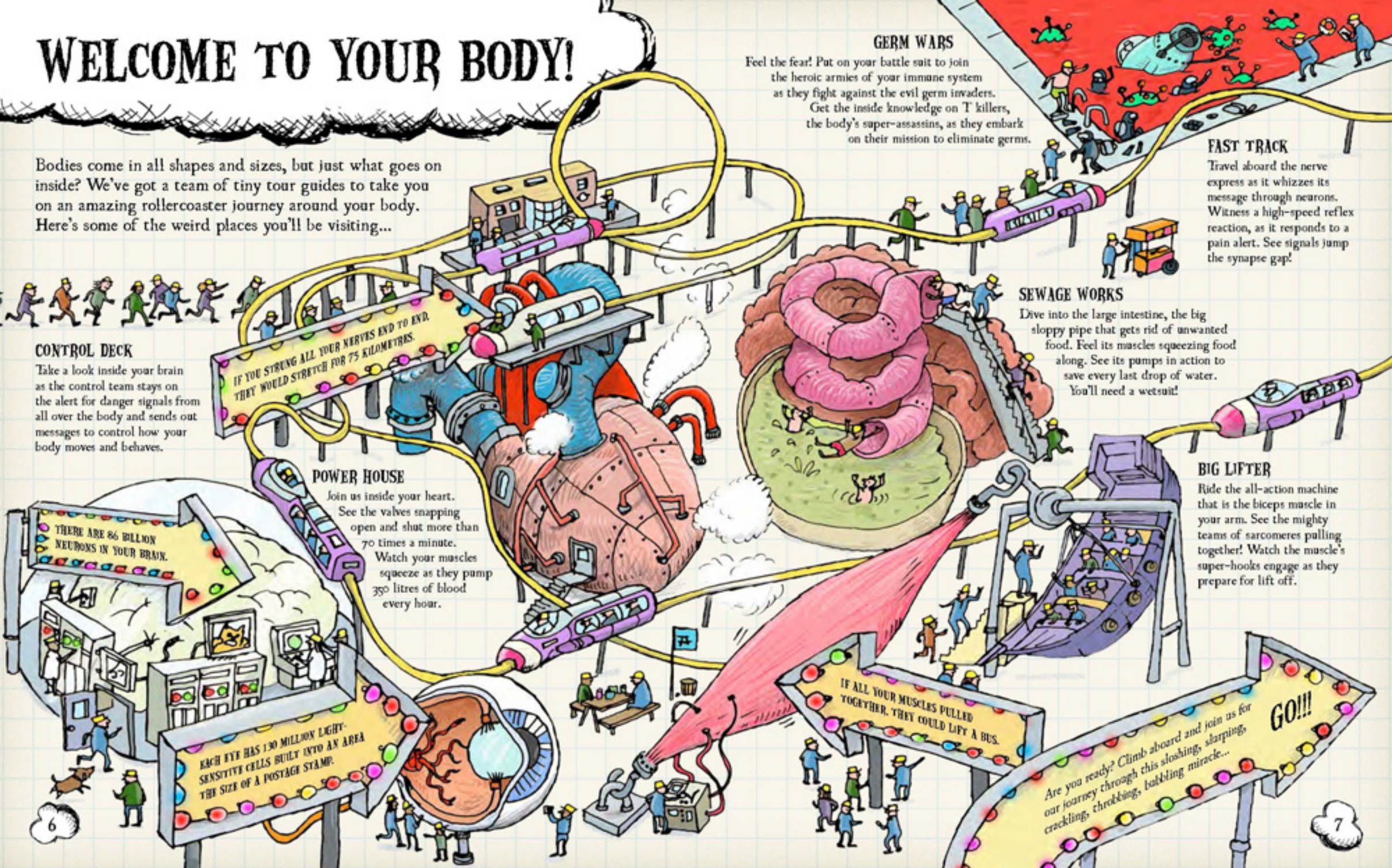
Please print off and read at your leisure.

WELCOME TO YOUR BODY!

Bodies come in all shapes and sizes, but just what goes on inside? We've got a team of tiny tour guides to take you on an amazing rollercoaster journey around your body. Here's some of the weird places you'll be visiting...



GERM WARS

Feel the fear! Put on your battle suit to join the heroic armies of your immune system as they fight against the evil germ invaders. Get the inside knowledge on T killers, the body's super-assassins, as they embark on their mission to eliminate germs.

FAST TRACK

Travel aboard the nerve express as it whizzes its message through neurons. Witness a high-speed reflex reaction, as it responds to a pain alert. See signals jump the synapse gap!

SEWAGE WORKS

Dive into the large intestine, the big sloppy pipe that gets rid of unwanted food. Feel its muscles squeezing food along. See its pumps in action to save every last drop of water. You'll need a wetsuit!

CONTROL DECK

Take a look inside your brain as the control team stays on the alert for danger signals from all over the body and sends out messages to control how your body moves and behaves.

POWER HOUSE

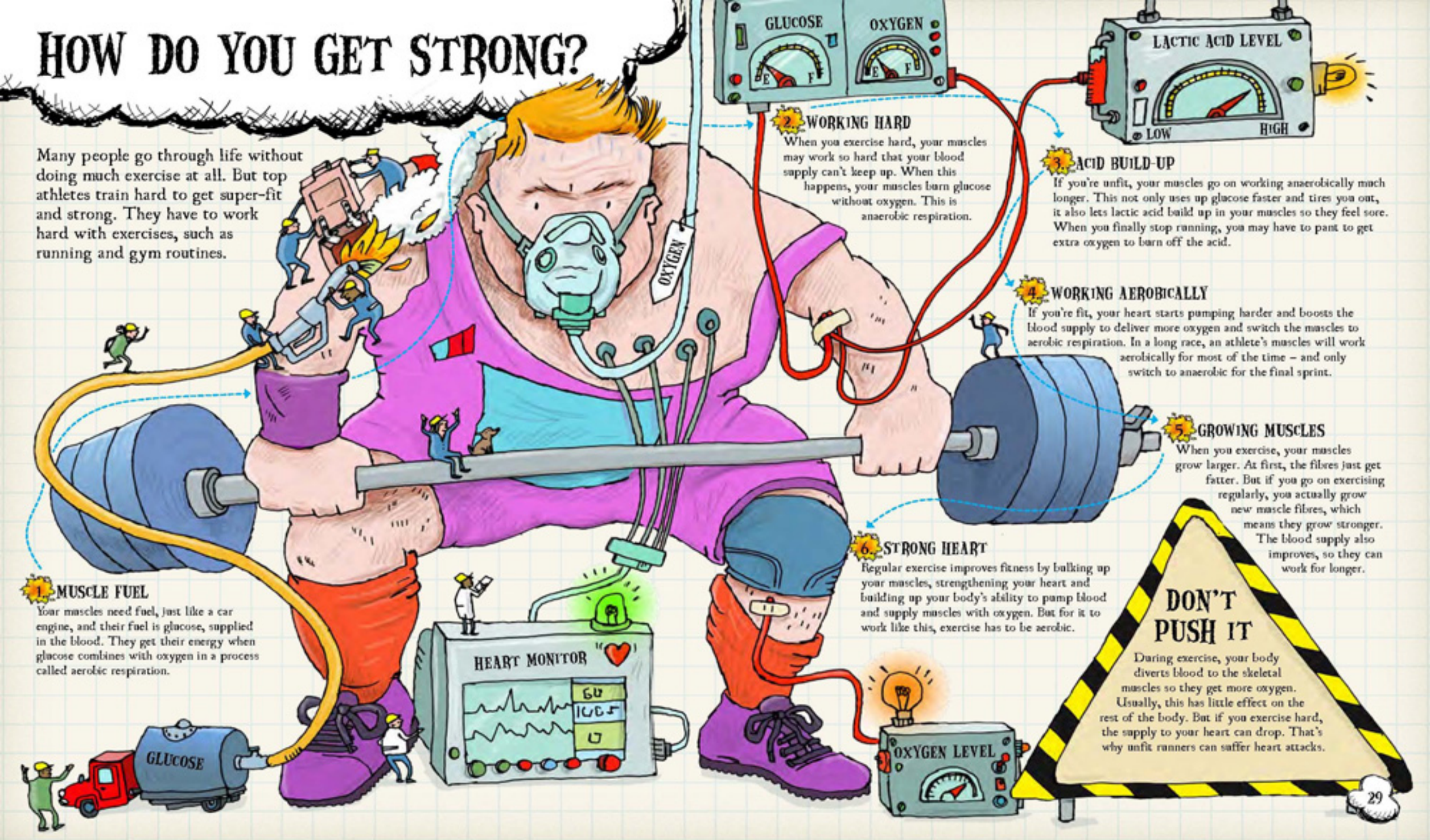
Join us inside your heart. See the valves snapping open and shut more than 70 times a minute. Watch your muscles squeeze as they pump 350 litres of blood every hour.

BIG LIFTER

Ride the all-action machine that is the biceps muscle in your arm. See the mighty teams of sarcomeres pulling together! Watch the muscle's super-hooks engage as they prepare for lift off.

HOW DO YOU GET STRONG?

Many people go through life without doing much exercise at all. But top athletes train hard to get super-fit and strong. They have to work hard with exercises, such as running and gym routines.



1. MUSCLE FUEL

Your muscles need fuel, just like a car engine, and their fuel is glucose, supplied in the blood. They get their energy when glucose combines with oxygen in a process called aerobic respiration.

2. WORKING HARD

When you exercise hard, your muscles may work so hard that your blood supply can't keep up. When this happens, your muscles burn glucose without oxygen. This is anaerobic respiration.

3. ACID BUILD-UP

If you're unfit, your muscles go on working anaerobically much longer. This not only uses up glucose faster and tires you out, it also lets lactic acid build up in your muscles so they feel sore. When you finally stop running, you may have to pant to get extra oxygen to burn off the acid.

4. WORKING AEROBICALLY

If you're fit, your heart starts pumping harder and boosts the blood supply to deliver more oxygen and switch the muscles to aerobic respiration. In a long race, an athlete's muscles will work aerobically for most of the time – and only switch to anaerobic for the final sprint.

5. GROWING MUSCLES

When you exercise, your muscles grow larger. At first, the fibres just get fatter. But if you go on exercising regularly, you actually grow new muscle fibres, which means they grow stronger. The blood supply also improves, so they can work for longer.

6. STRONG HEART

Regular exercise improves fitness by bulking up your muscles, strengthening your heart and building up your body's ability to pump blood and supply muscles with oxygen. But for it to work like this, exercise has to be aerobic.

DON'T PUSH IT

During exercise, your body diverts blood to the skeletal muscles so they get more oxygen. Usually, this has little effect on the rest of the body. But if you exercise hard, the supply to your heart can drop. That's why unfit runners can suffer heart attacks.

HOW DO YOU GROW?

Your body is an amazing round-the-clock, cell-making machine. Every moment, it's making millions of new cells, as old ones die.

1. TIME FOR AN UPDATE

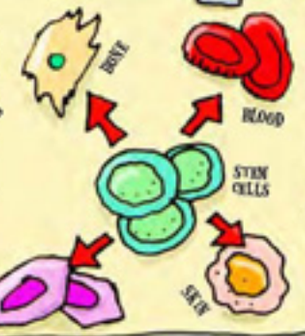
Most nerve cells last all your life, but skin cells last just a few weeks. On average, your entire set of body cells needs replacing every seven to ten years. You also need to replace any damaged cells.

2. GOING FOR GROWTH?

When you're young, you grow bigger every day. Your body does all this growing by making new cells. Sometimes you grow fast, and sometimes slow. But you only stop growing when you're an adult. Even then, your nose and ears go on growing.

STARTER CELLS

Your body has a stock of 'stem' cells, which are all-purpose cells that can be used to restock damaged or old cells. Stem cells can change as they divide to become the kind of cell needed.



3. DOUBLING UP

Your body can't build new cells from scratch. Instead, existing cells split in half, so each half becomes a new cell. When new cells are needed, cells go on dividing, creating more and more cells. This is called cell multiplication.

4. COPYCATS

All cells divide in the same way, so that new cells are exactly the same as the old ones. First the cell swells up. Then it copies its DNA, its program for life. All 23 pieces of DNA split in half lengthways to make two identical sets – one set for each new cell.

5. BREAKING UP

Once the cell's made sure its DNA is copied correctly, it sends one set to each end of the cell. Then the cell splits in half, and the membrane seals off each half to complete the new cells. This is called mitosis.

6. THAT'S ENOUGH

When you're young, you need to grow more. So chemicals called cytokines trigger cells to divide faster. But when a cut is healed or a body part is fully grown, other cytokines tell cells to stop dividing.

7. TIME TO DIE.

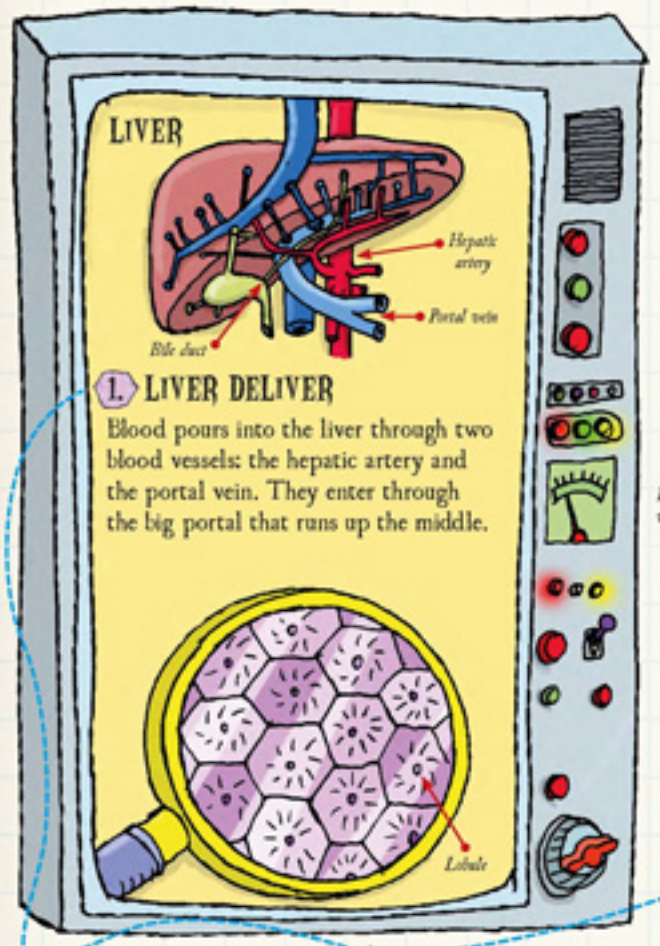
A new cell knows it's in the right place if molecules on its surface match its neighbours. The molecules are its address label. But if the neighbours are different, the cell simply dies. Cells also self-destruct when damaged or worn out. This is called apoptosis and it helps protect your body from cancers.

8. GROWING BONES

Right now, your leg and arm bones are growing longer. Cells are dividing and multiplying at special 'growth plates' on the ends of each bone. As new cells are added, the older ones are buried and turn into hard bone. When the bone has reached its full size, the growth plates seal over and turn to hard bone and you stop growing.

WHAT DOES YOUR LIVER DO?

Your liver is a super-hot powerhouse of chemical activity. Day and night, it's busy working on 500 different chemical-processing tasks at once – purifying the blood, whipping the nutrients you absorbed in your blood into the right chemical shapes for the body to use, making bile to speed digestion, and much, much more.



1. LIVER DELIVER

Blood pours into the liver through two blood vessels: the hepatic artery and the portal vein. They enter through the big portal that runs up the middle.

2. MICROPROCESSING

From the portal, blood vessels spread out through the liver carrying blood directly to thousands of little processing units called lobules. Lobules are long and hexagonal and split into wedges. Blood flows into each wedge through a channel called a sinusoid.

3. LIVER ACTION

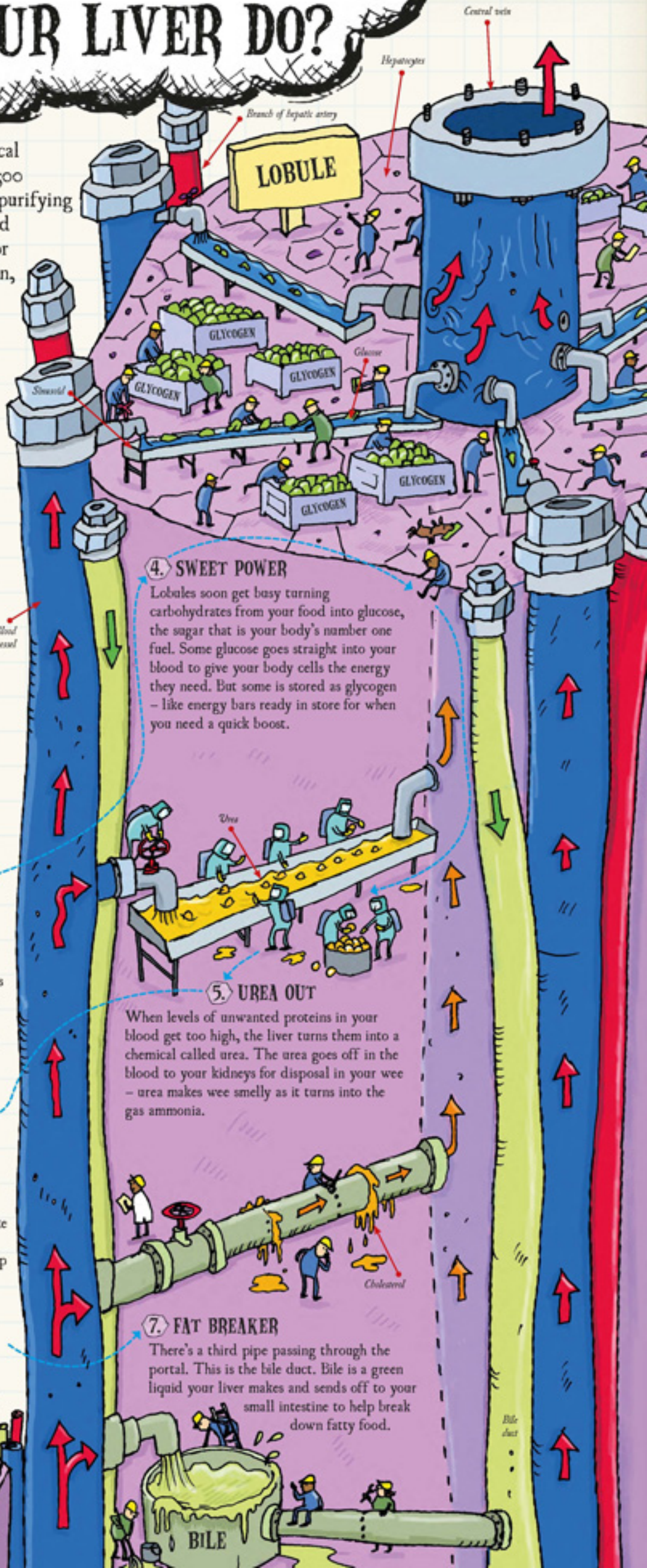
In each sinusoid are the liver's special cells, the hepatocytes. As blood flows past them, they extract the right chemicals, such as carbohydrates and proteins, process them and return them to the blood. Bile, though, is sent back out.

SOME OF THE LIVER'S MANY TASKS

- TURNING CARBOHYDRATES TO GLUCOSE
- STORING ENERGY IN THE FORM OF GLYCOGEN
- PACKING OFF EXCESS ENERGY FOR LONG-TERM STORAGE AS FAT
- CLEANING AWAY OLD BLOOD CELLS
- MAKING NEW BLOOD PLASMA PRODUCTS
- BREAKING DOWN WASTE PROTEINS
- TURNING FAT INTO CHOLESTEROL
- STORING VITAMINS

6. FATS

Your liver takes fat that has been absorbed from your food into your blood and uses it to make cholesterol. Your body needs cholesterol to keep your cells sturdy – though too much can clog up your arteries when you get older.



4. SWEET POWER

Lobules soon get busy turning carbohydrates from your food into glucose, the sugar that is your body's number one fuel. Some glucose goes straight into your blood to give your body cells the energy they need. But some is stored as glycogen – like energy bars ready in store for when you need a quick boost.

5. UREA OUT

When levels of unwanted proteins in your blood get too high, the liver turns them into a chemical called urea. The urea goes off in the blood to your kidneys for disposal in your wee – urea makes wee smelly as it turns into the gas ammonia.

7. FAT BREAKER

There's a third pipe passing through the portal. This is the bile duct. Bile is a green liquid your liver makes and sends off to your small intestine to help break down fatty food.

WHAT HAPPENS TO WATER?

Your body is more than 60 per cent water. Water fills your cells, makes up most of your body fluids and keeps the chemistry of life going. Making sure your water levels are balanced is one of your kidneys' main jobs.