

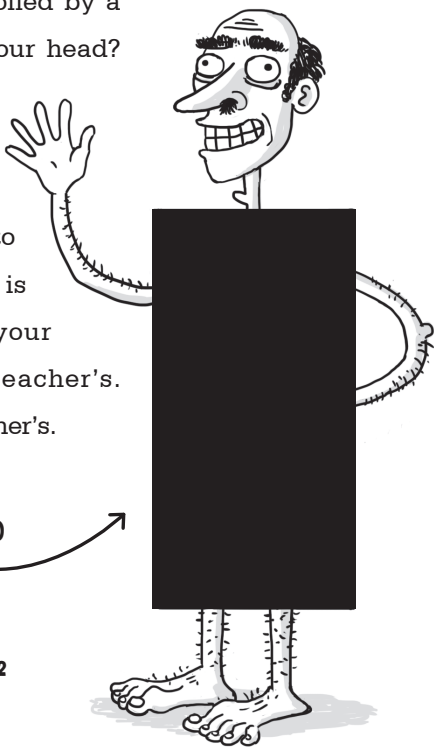
INTRODUCTION



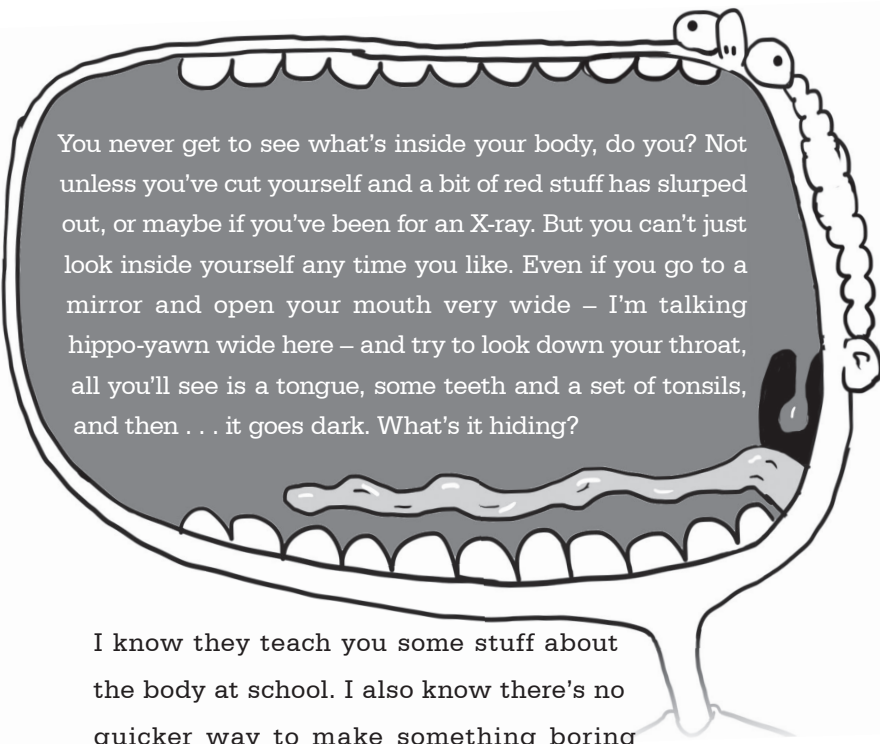
DO YOU EVER THINK about your body? Like really, *properly* think about it? I mean, sure, you can't help it when you've stubbed your toe or you've got earache or you've caught a stomach bug and feel like you're going to literally poo out your guts and your lungs and your brain, but . . . do you know what's actually going on in there?

Have you ever thought that your body is just a strange lump of meat, held up by a big pile of bones, wrapped in a bag of skin, and all controlled by a crazy supercomputer in your head? Oh, you haven't? Sorry if I've freaked you out. But what I'm saying is your body is *weird*. I don't mean to be rude. Everybody's body is weird – yours, mine, your parents', your maths teacher's. Especially your maths teacher's.

YOUR MATHS TEACHER'S BODY



**ACTUALLY, WE DECIDED
THIS WAS TOO WEIRD TO
SHOW YOU.**



You never get to see what's inside your body, do you? Not unless you've cut yourself and a bit of red stuff has slurped out, or maybe if you've been for an X-ray. But you can't just look inside yourself any time you like. Even if you go to a mirror and open your mouth very wide – I'm talking hippo-yawn wide here – and try to look down your throat, all you'll see is a tongue, some teeth and a set of tonsils, and then . . . it goes dark. What's it hiding?

I know they teach you some stuff about the body at school. I also know there's no quicker way to make something boring than forcing you to sit on an uncomfortable plastic chair and learn about it from a whiteboard. But just because your teacher might be boring, that doesn't mean the thing they're telling you about is. (Please note: this doesn't apply to maths. Maths would be boring even if a kangaroo in a bow tie was teaching you fractions while twerking.) The human body is a scientific marvel – an incredible machine that's been perfected over the last seven million years, give or take a few days. It's more advanced than a space station and smarter than the speediest super-

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computer. I'm not kidding – your brain can process 400 billion things a second. And 400 billion is massive. If you wanted to count to 400 billion, it would take you over twelve thousand years. (Don't try, or you'll miss dinner.)

LOOK, I GET IT. When you're given a new toy, the last thing you want to do is read the instruction manual – you just want to start playing with it. But you've had your body for years and years now, and I bet you don't know half the things it can do. It's finally time to open the instructions.

I'm going to take you through the body, organ by organ. When I say 'take you through' it, don't panic, I'm not going to dress you up in wellies and a waterproof jacket, put you into a shrinking machine and make you wade through miles of intestines. Firstly, I'm not totally sure that shrinking machines exist. Secondly, we'd get absolutely covered in poo. Not to say there won't be poo in the book – how could there not be? We all do it. Even your maths teacher. Sorry, I didn't mean to make you think of your maths teacher pooing. By the way, did you know that about a quarter of your poo is *alive*?! Don't worry, you're not about to get attacked by zombie turds –

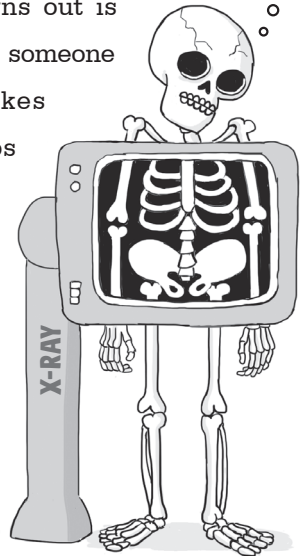
INTRODUCTION

it's just bacteria. Well, I say *just* – there's trillions of them in there. In fact, there are more bacteria in every poo you do than there are pages on the entire internet.

Let's find out all of your body's weird and wonderful secrets. Like the brain, for instance, which feels no pain. You could take a big stick and mush it around your brain and it wouldn't hurt at all. (Please don't take a big stick and mush it around your brain.)



Then there's your heart, which it turns out is neither bright pink nor heart-shaped, so someone should urgently tell whoever makes Valentine's Day cards. And it pumps enough blood around your body each day to fill ninety (pretty repulsive) baths. And how about your lungs, which puff out enough air every day to blow up a thousand balloons? Who needs a thousand balloons for their birthday? Save a bit of breath to sing 'Happy Birthday', for goodness' sake.



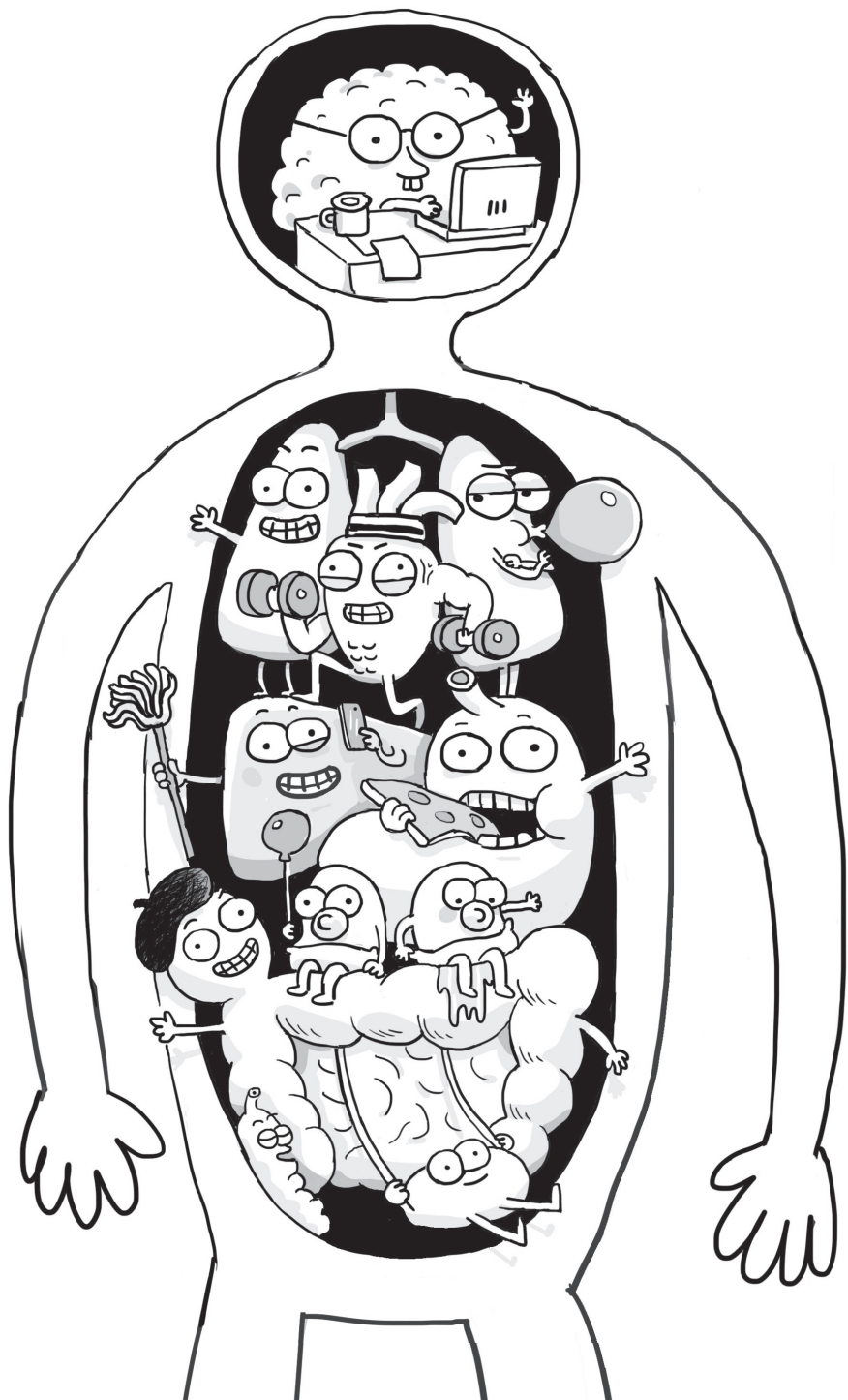
Like a sightseeing tour, we'll take in all the best bits, such as the skin, which is the largest organ in the

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human body and the one you'd look the weirdest without. But did you know your skin isn't actually your outermost part? Wherever you go, you're always surrounded by an invisible cloud. 'A cloud! How cute!' Nope. It's a cloud of thousands of tiny bits of skin that flake off you, along with cells that come out of your various giblets every time you speak, yawn, burp or fart. And, if you think that's disgusting, wait until I tell you about the weird creatures who live in your eyelashes. Or, worse still, what they eat for dinner.

How do you know I'm not making this all up? Well, I worked as a doctor for years and years. These days I write books, but hopefully I haven't forgotten *too* much about how the body works. It would be a real shame if I was teaching you a load of absolute nonsense, but I guess you won't know until you fail your exams. So you're probably just going to have to trust me . . .

In this book I'm going to answer every question you could possibly have about the human body, including the things your teachers and parents quickly change the subject about when you ask them. (Probably because they don't know the answers. Idiots.)



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You can expect questions like:

WHAT'S THE LARGEST MUSCLE IN THE BODY? No, gluteus maximus isn't a Roman emperor, it's what doctors call your bum, and it's the largest muscle you've got. Doctors have fancy words for every part of the body, by the way. Mostly so we don't have to constantly say things like 'bum'.



ARE BOGEYS SAFE TO EAT? Look, if your nose is going to all that effort of creating a snack, the least we can do is look at its nutritional value, right? (Yes, they're safe. Chew away!)



HOW MUCH OF YOUR LIFE WILL YOU SPEND ON THE TOILET? About a year – so bring a good book. (I recommend this one.)

And there are hundreds more where those came from.

I'll also explain how your body can sometimes go on the wonk. Just like a tablet can crash when you update an app, your body is another complicated bit of kit which

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malfunctions from time to time. I'll tell you exactly what it means to have conditions that you or your friends might already live with, like epilepsy or diabetes or asthma, as well as the everyday stuff that never seems to get you a day off school. I'm talking colds and bruises, and the dreaded face art that is an attack of the spots. Basically, anything that makes you ask, 'Why on earth is this happening to *me*?'



Speaking of which, we'll have a nosey at some of the changes your body goes through as it prepares you for adulthood. It's not all wearing ties, drinking coffee and

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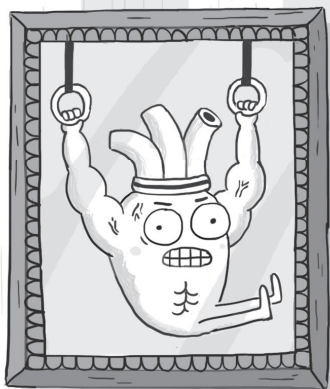
shouting at people, you know. Puberty is a bit like transforming into a totally new person who looks like a squeezed and stretched-out version of you, so I'll explain about all that, and the feelings you might be dealing with too.

We'll take a look at the things your body would probably rather you didn't do, such as smoking, drugs and alcohol, eating unhealthy food, or not getting enough sleep or exercise. No judging, no taking your phone off you for a week; just telling you what's what. Your body belongs to you after all – you can do what you like with it. (Though maybe don't go snowboarding in your underwear.)

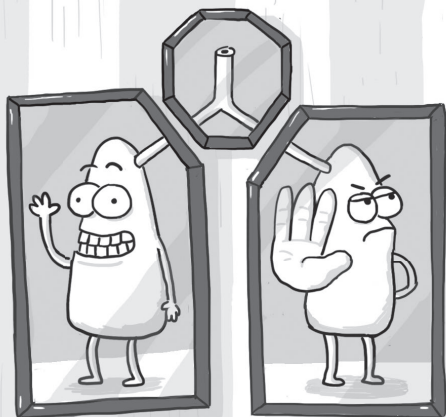
So, if you're ready to learn things that you can't possibly unknow and to be furnished with facts that, while incredible, you probably shouldn't repeat at mealtimes, then this is the book for you. Take a seat, let your creepy cloud of dead skin and poo-dust settle around you, and welcome to . . .

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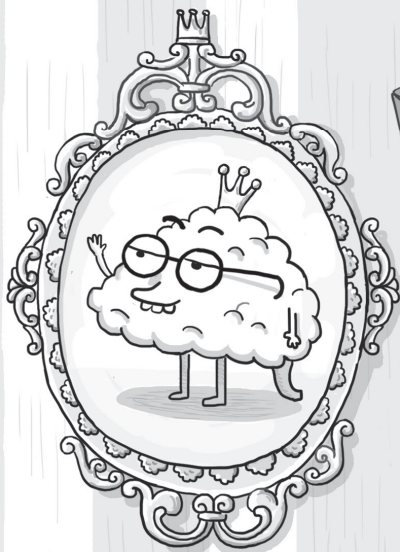
AN ORGAN is a large musical instrument with a couple of keyboards, loads of different pedals and some massive pipes. (An organ can also mean a part of your body that does a specific thing.)



HEART - PUMPS BLOOD



LUNGS - PUMP AIR



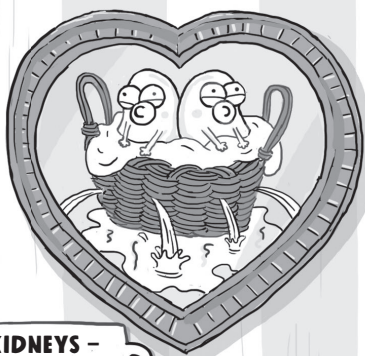
**BRAIN - PUMPS NOTHING
(BUT IT'S STILL FAIRLY USEFUL)**



**STOMACH - WHERE
FOOD GOES**



INTESTINES – MAKE POO



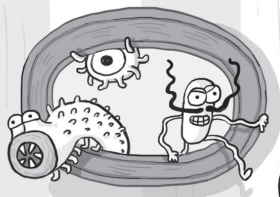
**KIDNEYS –
MAKE WEE**



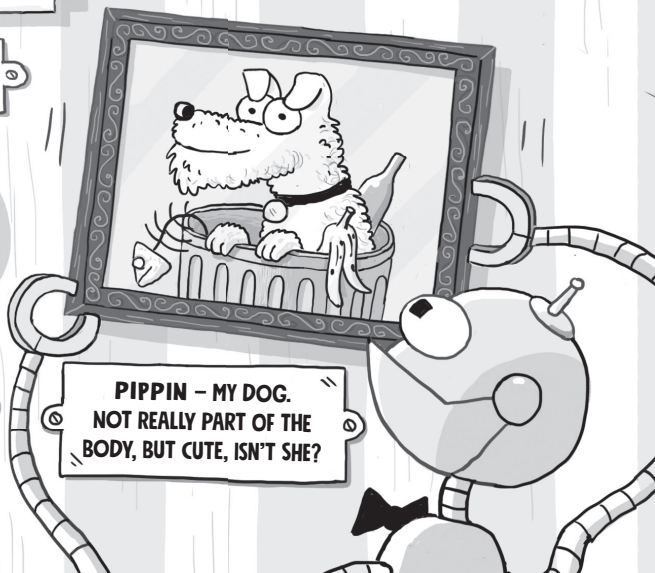
**LIVER – CLEANS
UP YOUR BLOOD**



**CELLS – THE LITTLE LUMPS OF LEGO
THAT EVERY ORGAN IS MADE OF**



**BACTERIA &
VIRUSES – ANNOYING
AND INFECTING**



**PIPPIN – MY DOG.
NOT REALLY PART OF THE
BODY, BUT CUTE, ISN'T SHE?**

CHAPTER 1

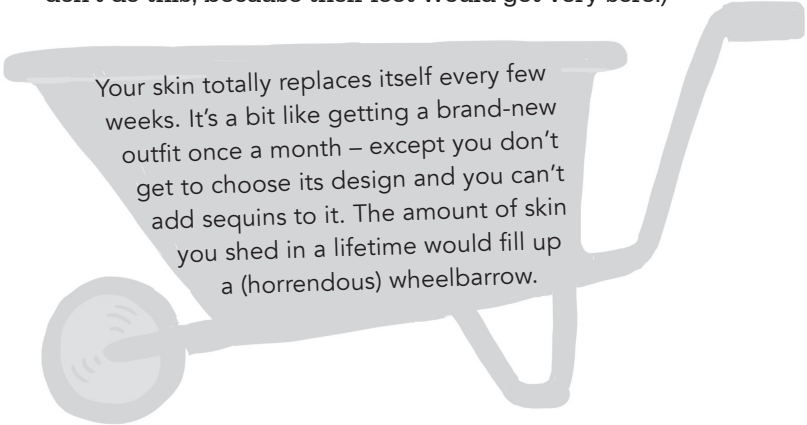
SKIN



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THANK GOODNESS FOR SKIN. Can you imagine the absolute mess you'd make when you walked around if you didn't have any? Flesh dangling off your bones. Various innards trailing behind you. Actually, let's stop imagining that – I'm feeling a bit sick now. It might just look like a very tight onesie, but your skin is actually an extremely sophisticated organ. You never think of your skin really weighing anything, do you? But, in the unfortunate event that it was separated from the rest of your body and chucked on the bathroom scales, your skin would come to somewhere between 4 and 8 kilograms (depending on how tall you are) – that's heavier than a bowling ball.

Like everything else in your body, your skin is made up of cells – 35 billion of them, to be precise. 35 billion is quite a lot, by the way. If you stood 35 billion hamsters in a line, they would stretch all the way around the sun. (Please don't do this, because their feet would get very sore.)



Your skin totally replaces itself every few weeks. It's a bit like getting a brand-new outfit once a month – except you don't get to choose its design and you can't add sequins to it. The amount of skin you shed in a lifetime would fill up a (horrendous) wheelbarrow.

How thick your skin is depends on where it is on your body. (I mean the depth of your skin, by the way, not how stupid it is.) It's thickest on the bottom of your feet, otherwise they'd be covered in holes like a worn-out pair of socks, and it's thinnest on your eyelids, because otherwise you'd have to prise them open with your fingers every morning and there would be a loud clunking noise every time you blinked.

Skin cells replicate themselves faster than any other cells in your body – you make millions and millions of new cells every single day. So, next time some annoying adult accuses you of being lazy because you've been playing computer games for five hours, you can simply explain that you were actually making huge numbers of skin cells.

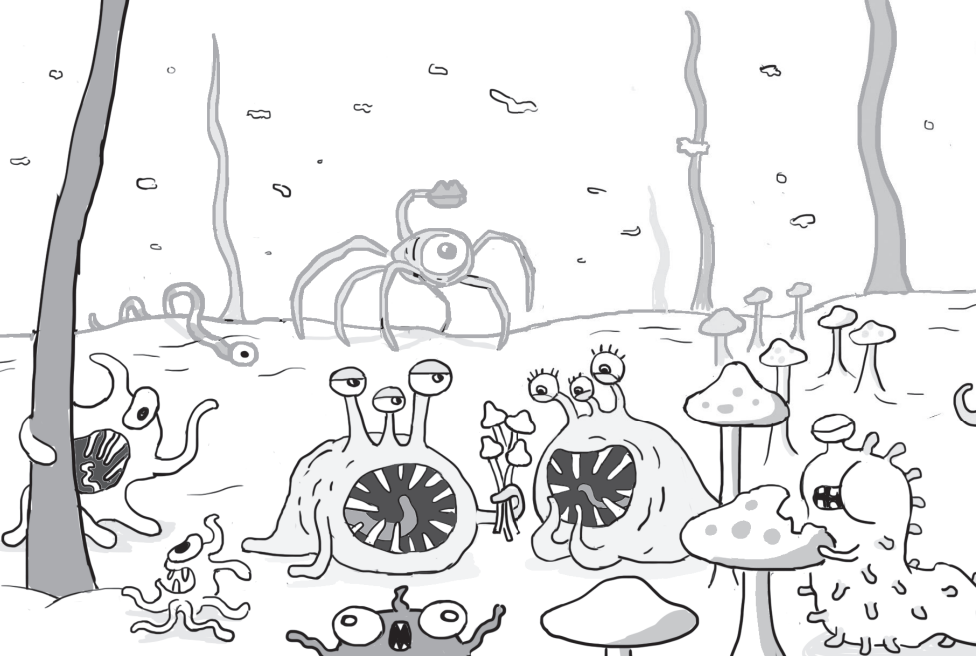
And what happens with your old skin? You obviously don't just get wider and wider until you can't fit through the front door. Well (and I hope you're sitting down while I break this to you), your skin sheds it. Not in one go like a snake, but constantly. See that dust all over your bedroom because you refuse to clean it until your pocket money gets increased? It might be time to grab the Hoover because that dust is mostly flakes of . . . you.

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Whoops – there go another couple of thousand skin cells. And a few thousand more. If you could see them coming off, it would look like you were snowing some quite disgusting snow.

Let's take a quick break from this revoltingness so I can tell you about my dog, Pippin. She's one year old, she's an Airedale terrier, and her hobbies include taking walks, drinking from puddles and being sick on the sofa.

Do you have any pets? How many? Nope – wrong answer. You've actually got millions and millions and millions of them . . . all over your skin. Sorry, we're back to the revoltingness already.



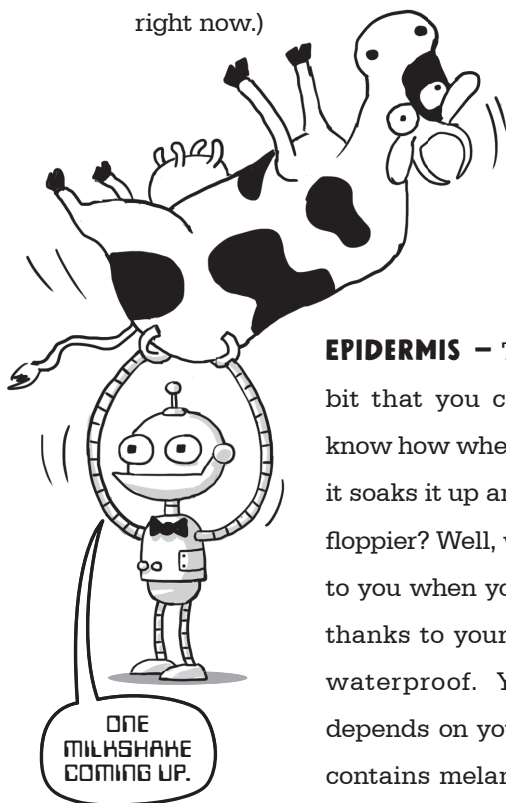
SKIN

Viruses and bacteria and various types of fungus and tiny insects rub shoulders on every inch of you. (Well, they don't actually have shoulders, but you get the idea.) It's nothing to worry about – they're just a bunch of laidback dudes getting on with their day and keeping your skin safe and healthy. All of this means that you're surrounded every second of the day by a cloud of germs and dead skin. Oh, and particles of fart too, which should probably be called farticles. So, next time you hug a friend or a parent, you now know that you're covering them in your farty skin-cloud. Mwahaha! The downside is that they're also covering *you* in *their* farty skin-cloud. Ugh.

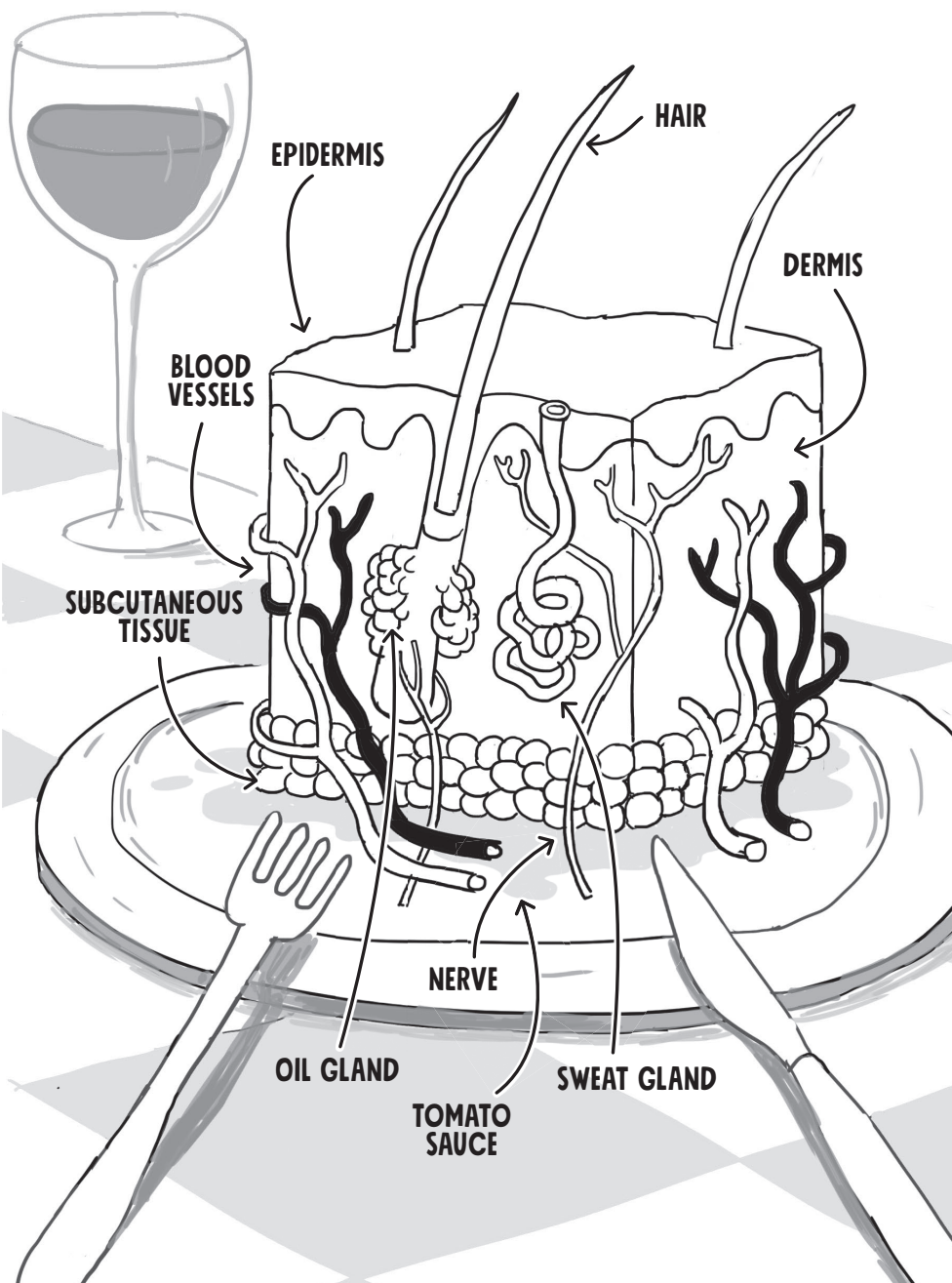


LAYERS OF THE SKIN

Unlike your robot butler, who's only covered in a single sheet of metal, your skin is made up of various layers, like a horrible dry lasagne. (Oh, you don't have a robot butler? Shame. Mine's making me a chocolate milkshake right now.)



EPIDERMIS – This is the top layer: the bit that you can see and touch. You know how when you put pasta in water, it soaks it up and gets much bigger and floppier? Well, why doesn't that happen to you when you go swimming? It's all thanks to your epidermis keeping you waterproof. Your skin colour also depends on your epidermis, because it contains melanin. (Not to be confused with a fruit salad, which has melon in.)



HAIR

EPIDERMIS

DERMIS

BLOOD VESSELS

SUBCUTANEOUS TISSUE

NERVE

OIL GLAND

SWEAT GLAND

TOMATO SAUCE

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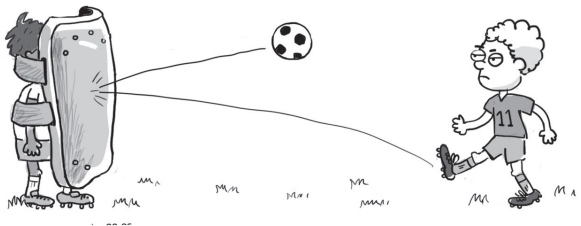
The more melanin you have, the darker your skin colour; the less melanin you have, the lighter your skin colour.

Also in the epidermis are freckles – harmless little patches of melanin that are unique to you, and that you can use for a game of join-the-dots if you get bored.



DERMIS – Head down a level to your dermis and there's a *lot* going on. There are a load of blood vessels and nerves, as well as your sweat and oil glands, which stop your skin getting too dry. This is the strongest layer, and it's what prevents your skin from ripping like cling film. The dermis is the part of the skin that contains your fingerprints, and it's also where tattoo ink goes. I'm thinking of getting a tattoo of my eyes on my eyelids so no one will know when I fall asleep during boring conversations.

SUBCUTANEOUS TISSUE – This is the basement layer, and it's where your fat lives. However thin we are, we all have a layer of fat, and it's very good that we do, because it keeps us warm and protects us from bumps and falls. It's like a massive shin pad that covers our whole body.



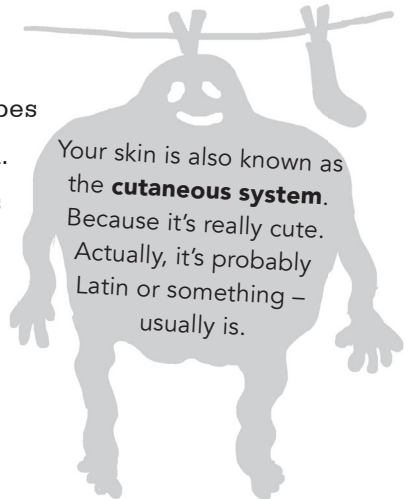
FUNCTIONS OF THE SKIN

Your skin is more than a walking carrier bag that makes sure your insides don't end up as your outsides. It has lots of other important functions, such as temperature control, your sense of touch and turning bright green every Wednesday. (One of these might not be 100 per cent true.)



TEMPERATURE CONTROL

Chuck that electric fan in the bin and rip the radiators off the wall – your skin has all sorts of schemes and wheezes to keep you at a toasty 37 degrees – which, funnily enough, is known as body temperature. If it's hot outside or if you've been doing something energetic like carrying a horse (you weirdo), then your body turns on its sprinkler system to cool you right down again. Your brain tells the sweat glands deep in your dermis to get busy, and they send sweat up little tubes shaped like strings of spaghetti. Sweat comes out of tiny little holes called pores. They're too small to see, so you'll have to trust me on

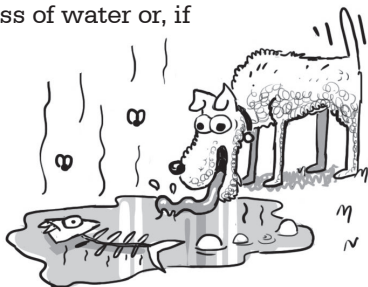


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this, but you've got millions and millions of holes all over your skin. You're basically a massive sieve.

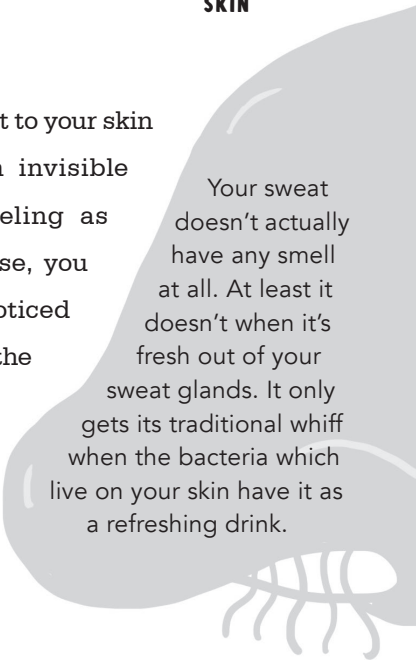
On hot days or if you've been running (for example, if your robot butler has malfunctioned and is chasing you around your bedroom), then you can lose loads of fluid through sweat, so it's very important you drink a lot to replace everything that has escaped out of your skin. If you don't, then you risk getting dehydrated – this can make you feel tired, give you a headache or even make you faint. So grab a glass of water or, if you're Pippin, drink from a disgusting puddle.

How about when it's a cold day? Well, your skin has another trick up its furry little sleeve. Tiny hairs on your arms and legs stand on end,



Your lips are one of only a few parts of the body that don't have any sweat glands – that's why they can get dry and chapped when it's hot. No one really knows why they don't sweat – maybe it's because deodorant doesn't taste very nice.

trapping a thin layer of air right next to your skin and keeping you warm like an invisible jumper. You may know this feeling as 'goosebumps'. Or, if you're a goose, you may know it as 'bumps'. Ever noticed how your fingers and toes get cold the fastest when it's freezing outside? That's your brain deciding that it's less important for your blood to go to your skin and more important that it goes to . . . itself. A bit selfish, if you ask me.



Your sweat doesn't actually have any smell at all. At least it doesn't when it's fresh out of your sweat glands. It only gets its traditional whiff when the bacteria which live on your skin have it as a refreshing drink.

PROTECTION

Skin is your first line of defence against the outside world. It stops you getting infections, it means you don't get damaged by heat, and it prevents injuries. And do you ever stop to thank your skin for doing all this? Do you heck. Say thanks to your skin for protecting you. Go on, do it now, I'll wait.

Done? OK, let's carry on.

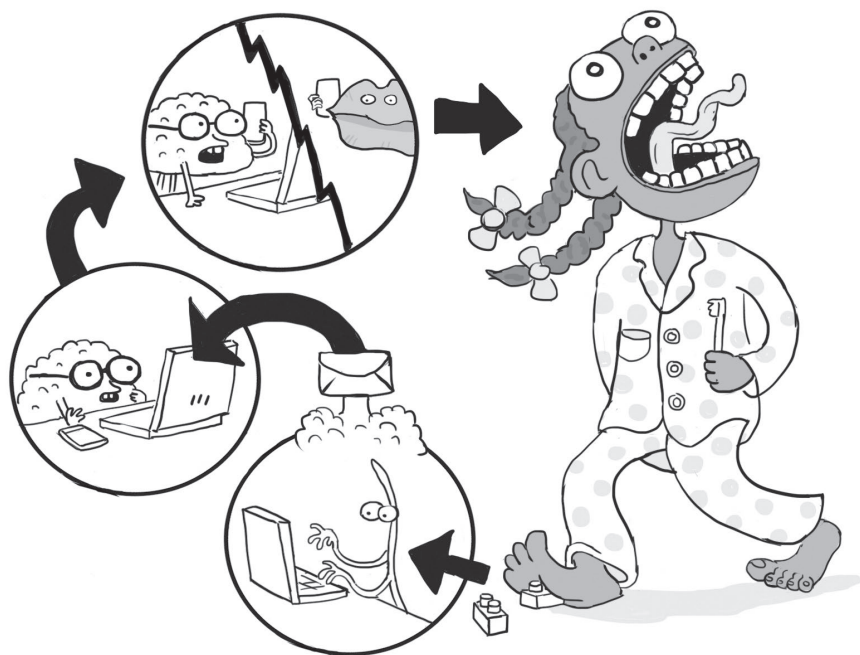
TOUCH

Your sense of touch is really important. It sends messages to your brain to tell it if you're safe, or whether there's anything dangerous you need to know about. Are you wet, or hot, or cold, or in pain? That's up to your skin to find out – and to do this it uses millions and millions of receptors. It has different types of these receptors to detect things like gentle touch, sharp touch, deep pressure, vibrations, temperature and pain. For anything you need to feel, your skin's got you covered. (Literally.) Some areas, such as your fingertips, have many more receptors than others – that's why it feels like the end of the world if you get a paper cut. I got about fifty paper cuts writing this book, so I hope you're feeling very sorry for me right now. If the nerve endings in your skin feel pain, they send a message straight to your brain.

Dear Brain,

Just to say that it feels like our right foot is standing on a piece of Lego. You might want to lift this leg up urgently, and tell the mouth to scream quite loudly. Whenever is convenient, although I do recommend doing it immediately.

Lots of love, Skin xx



LUMPS AND BUMPS

Unless you spend your life in a house built out of cotton wool, wearing a hat made from feathers and a marshmallow tracksuit, you'll find yourself getting cuts and scrapes and blisters and bruises. Here's what your skin is really up to when it goes multicoloured.

BLISTERS

You know blisters – those annoying little watery pillows that appear if a new pair of school shoes is rubbing on your skin, or if you've climbed Mount Everest wearing flip-flops. This friction on your skin makes the epidermis separate from the dermis underneath, and some fluid (plasma, in fact) leaks into the gap. Now, I realize it's very tempting to pop the blister and see how far it will squirt, like some kind of foot-shaped water pistol, but I recommend you give that a miss.



Firstly, the fluid in the blister is there to do a job and will help you heal quicker. Secondly, remember how your skin has to keep you safe from germs? Well, that's rather difficult if you're bursting it like bubble wrap all the time. You even risk causing a serious infection. This happened to my friend Nick – he picked a blister on his foot and it got so disgusting and pus-filled that he had to go to hospital. (When he texted me a photo of it, I was almost sick.) Leave your blister alone and it'll disappear on its own in a few days.

BRUISES

When a wall isn't looking where it's going and thoughtlessly bumps into you, you might end up with a bruise. This means you've damaged the blood vessels in your skin, and a bit of blood has leaked out. Because you haven't cut your skin, the blood doesn't have anywhere to go, so it spreads out underneath. One bruise, coming right up.

Bruises change colour over the week or two when they're loitering under your skin, a bit like a disgusting set of traffic lights. They start off red, which is fair enough, because that's the colour of blood. But after a day or so,

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the bruise starts redecorating. First, it goes sort of bluey-blacky-purple, because the oxygen in your blood has been used up. Then the blood starts to dissolve, and your bruise will go green, and then finally, after a week or so, it will fade to its final colour: yellow. Blood vessels in the skin get weaker with age, so older people are more likely to get a bruise if they clonk themselves. In other words, maybe you should tell Grandma to give up ski jumping.



ECZEMA

We all get dry skin once in a while, but there's a very common condition called eczema where you have dry and itchy skin a lot of the time. It often affects the insides of the elbows or the knees but can occur anywhere. It's not contagious (which means you can't catch it from other people), it can be treated with creams and ointments, and it's really difficult to spell.

BURNS

It's extremely important to be careful around anything that might be hot – for example, saucepans, irons, kettles, hair straighteners, hot drinks and volcanoes. First-degree burns are the most common sort of burn, and they make your skin go red. This means the burn has only affected the epidermis and will almost always heal very well. Second-degree burns are deeper and go through into the dermis – this can cause blisters on the skin, and only occasionally causes scarring. Third-degree burns are the most serious, where the burn goes right down into the subcutaneous tissue. A third-degree burn will always need hospital attention, sometimes even surgery, and it often causes scarring. If you burn yourself, you need to call an adult for help and then run

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the bit you've burned under cold water for about twenty minutes. (I know, I know. That's a long time and you're very busy – but it really is important.) You might need to go to hospital to get checked out or you might need to do an impression of a cheese sandwich and have the burn covered in cling film – this makes it less likely that you'll get an infection.

SCARS

How many scars have you managed to achieve over your lifetime so far? Whether it was the result of an operation or a disagreement between your face and the pavement, chances are you've got a scar or two somewhere on that big bag of skin you wear. Even though your skin is very good at mending itself, if the damage goes right to the dermis then it sometimes leaves a mark. This is because of a substance called collagen, which is basically a type of cement your body uses to repair injuries deep down in the skin. Collagen is very effective at gluing you back together, but it can leave a white mark. Scars fade with time, but may never totally disappear. I've still got a scar on my forehead from accidentally running into a dinner lady holding a metal tray when I was eight. (No need to worry, she didn't spill any food.) Scars can be a good