

# People are made of cells

Compared to jellyfish, ants or dogs, we human beings look and behave pretty much the same. And you and I resemble our parents and grandparents more than other people, at least that's what they say.

It is amazing, because every living being consists of huge numbers of tiny cells, and all the cells that make up animals, plants and even mushrooms have a similar basic look and tasks. They produce the things that cells need to stay alive and to work together with all the other cells.

Billions and billions of human cells—much too small to be seen without a microscope—are busy inside our bodies. There are many different kinds of cells with different jobs, but together they let us grow up, keep us alive and let us sing, eat and jump... although each of us is a unique person.

## HOW DO OUR CELLS KNOW WHAT TO DO?

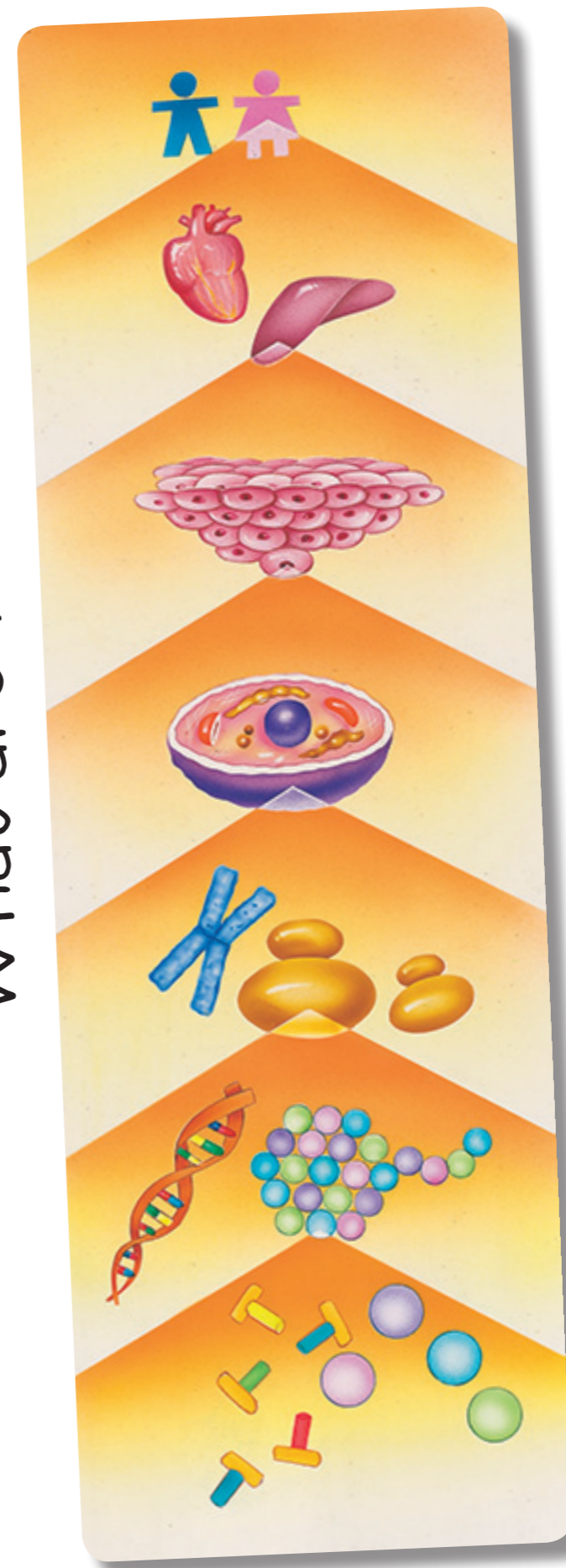
They have all the instructions stored inside them, and these instructions are called genes. Dog cells look very much like our cells. But they have dog genes, so they do the right things to make a dog a dog.

## AND HOW DO OUR CELLS GET THEIR GENES?

They get them from the very first cell from which our life started in our mother's womb. This egg cell multiplied over and over again to make all the different types of cells in our bodies. And whenever a cell divides, it passes on the same set of genes to the two fresh cells. So a dog's egg cell will always make puppies, not ducklings or jellyfish or bacteria.

Let's have a look at the picture on the right. From top to bottom, it goes from the whole body to its smallest parts, showing how these parts work together at each stage.

What are we made of?



**Body**  
All parts of the body work together in perfect harmony.

**Body parts,**  
Bones, muscles and organs like the heart, liver and skin are all made up of cell tissue.

**Tissues**  
Cells stick together to form solid cell tissue.

**Cells**  
Cells come in different kinds and shapes. This is a typical one.

**Organelles**  
The many small organs of a cell are made of proteins. Some organelles also contain DNA.

**Proteins and DNA**  
Proteins and DNA are made up of amino acids and nucleotides.

**Amino acids and nucleotides**  
They are the smallest parts in our body. We get them through the food we eat.

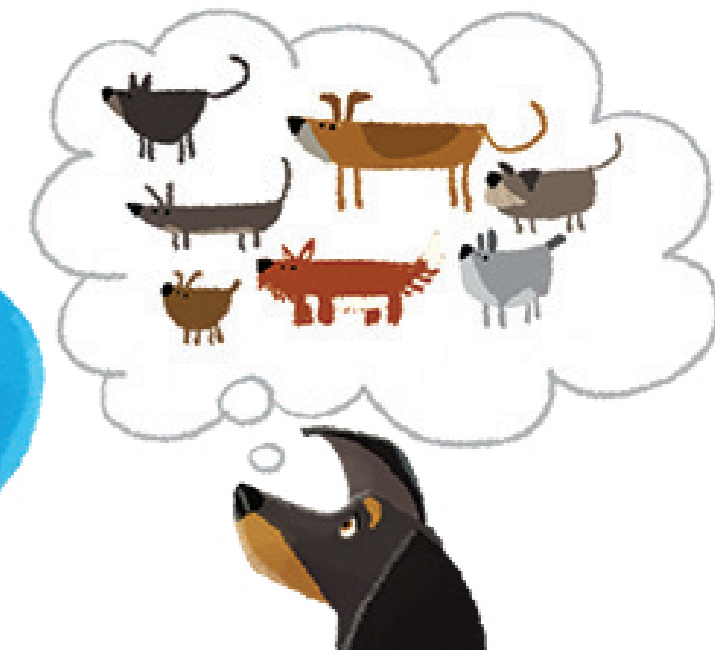


# Different genes, different proteins, different people

We all have almost the same genes. Identical genes make identical proteins. And identical proteins make sure that all people have the same cells working in the same way in pretty much the same places in the body.

## SO, WHY DON'T WE ALL LOOK LIKE IDENTICAL TWINS?

Because our DNA sequences are not exactly identical. Each of us inherited a slightly different set of genes. They determine the color of our hair, eyes and skin, whether we will have freckles, can digest milk, or are more or less likely to get a certain disease. They also make the shape of the face and determine whether someone has a stub nose or a long nose. In many cases a lot of genes work together.



Some groups of people have common features. Children of Asian parents, for example, share genes that give them a characteristic eyelid shape. And people with dark skin just make larger amounts of a black coloring substance in a special kind of skin cell. But all of us have nostrils on our noses that sit right in the middle of the face, not on the back of our head, like dolphins. And why we have eyes in the front and not on the side, like rabbits. And unlike birds, we have genes that tell our cells to make ears.

## HOW CAN CELLS MAKE EARS?

The cells that make them have no idea what the ears will look like in the end. They just divide and divide, until our genes tell them to stop. Or to keep making the ear bigger. They do this at a certain time and a certain place, and that is the amazing way how cells form a tissue with a particular shape. And since we have slightly different genes, all human ears look a bit different. Check it out!



# A double portion of genes, please!

Only egg cells and sperm cells have a single portion of genes. All other cells have a double set. The same genes always sit at the same spot on both chromosomes. But they are not always completely identical. Sometimes they come in two different versions, called alleles.

For example, there are genes responsible for hair color. One gene, maybe from mom, tells the cells to make black hair proteins. The other version from dad makes rather proteins for blond hair. Now both genes go to work on the cells that make hair. What color hair will the child have?

## SOME BLOND HAIR AND SOME BLACK?

No, that is impossible. Each hair will have the same color as the others, because they are made by the same kind of cells. And the same cells make the same proteins. So the hair color might be something in between black and blond, but probably black. This is because genes for black hair are usually stronger than their rival allele. The dominant genes will win. The loser genes that do not get their way are called recessive.

## CAN RECESSIVE GENES SHOW UP AGAIN?

Yes, because they will not get lost. Parents with dark hair may have inherited recessive blond hair genes from their parents and then pass them on to their own children, along with the dominant dark hair genes. And then the hidden blond gene might well be the one that shows up in the kid. This happens when the child received two blond hair color genes.



A deep look into our skin. The cells in the hair root (the big bag) make keratin proteins that make up hair. Some other proteins add color. See the nerve cells connected to the bottom of the bag? They are why it hurts to pull out a hair.

