



DOCTOR STONE IN THE WORLD OF
Medical Geology



SERVIÇO GEOLÓGICO DO BRASIL
CPRM



Patricia Duringer Jacques

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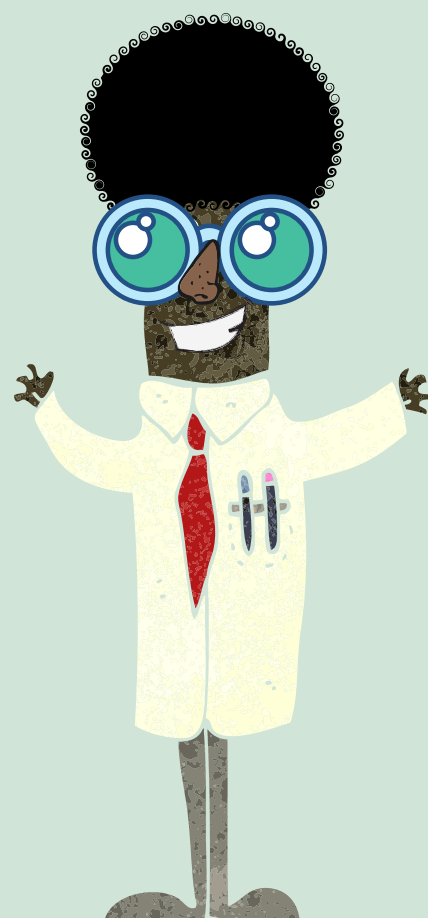
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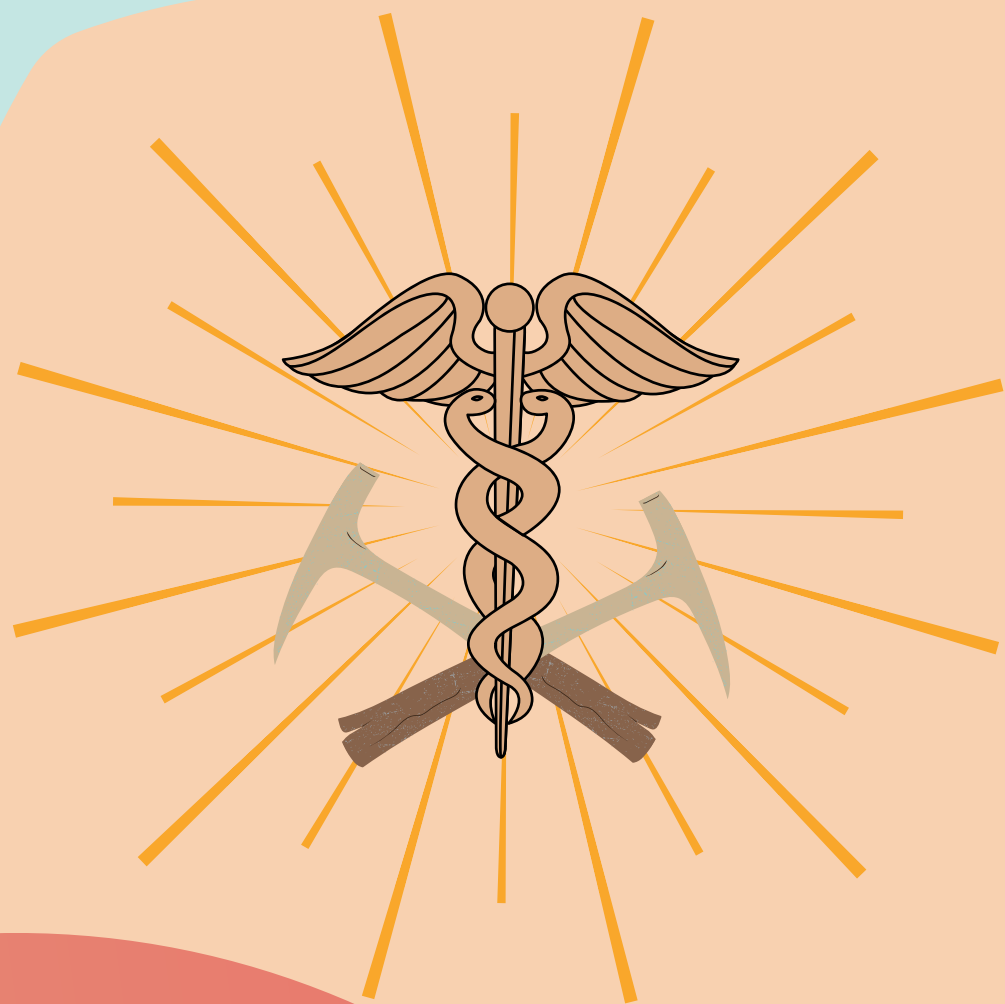
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Hello, I'm Doctor Stone
and I'd like to talk about a
very interesting area of
study called
"Medical Geology".
Have you ever heard
about it?



As the name shows it involves two very interesting jobs, geology and medicine, so it's about the knowledge of our planet and how it affects our health.



But it can involve other jobs such as: dentists, biologists, nurses, agronomists, chemists, nutritionists, etc.

Anyway, medical geology involves many professions in the health fields and geosciences.

Medical geology studies the influence of environmental geological factors on the quality of human and animal health.*



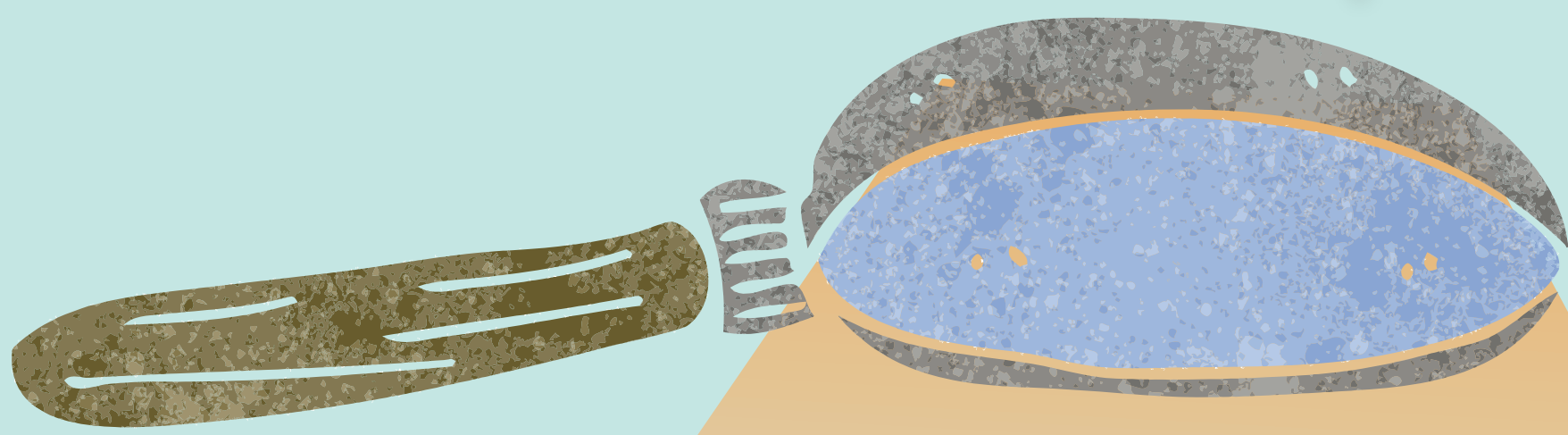
This area of study researches the influence of water we drink on our body; the air we breathe on our well-being; or even the influence of the food on our health.

Let's study some examples?

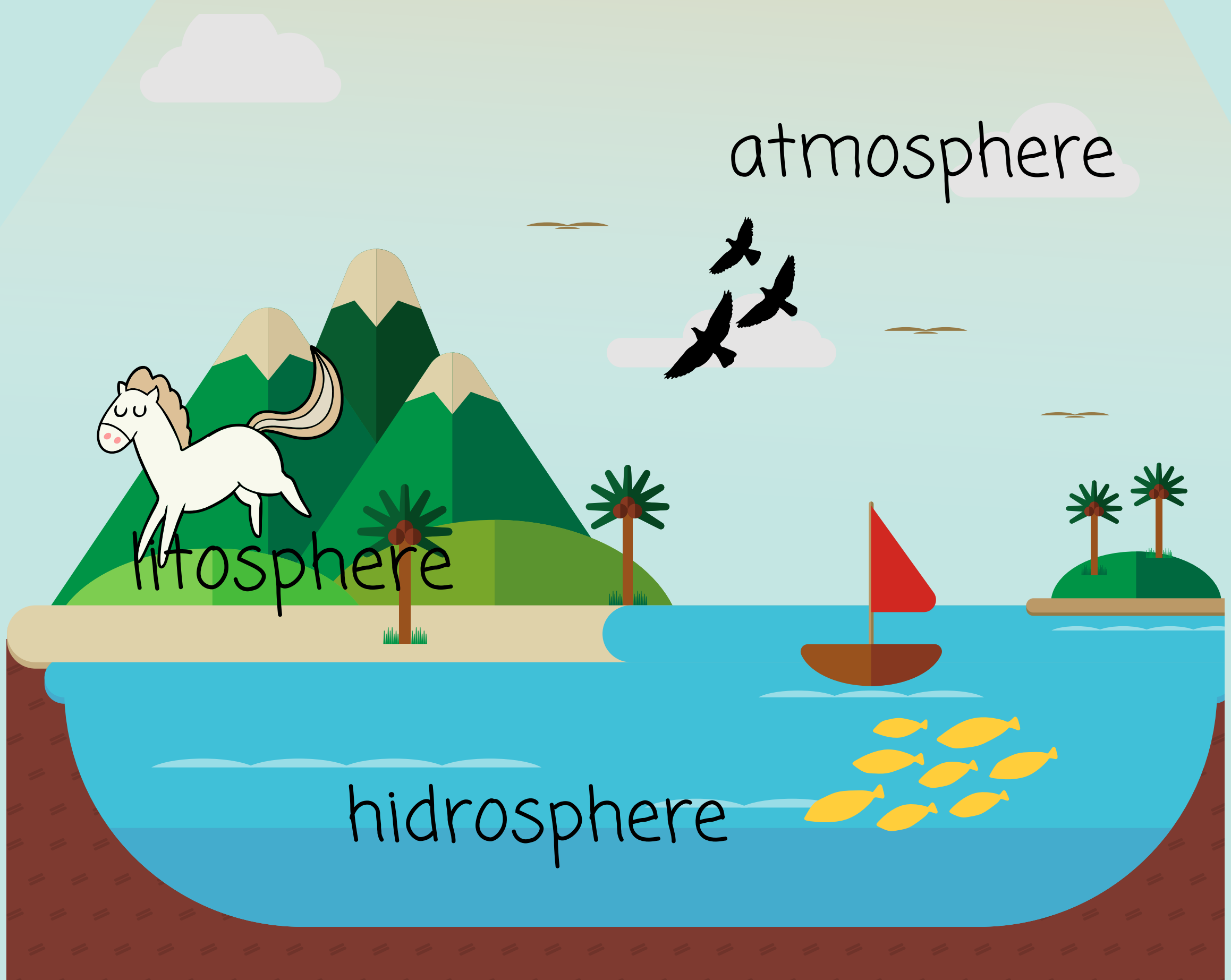
- Selinus, O., Frank, A., 2000. Medical geology. In: Moller, L.(ed.). Environmental Medicine. Joint Industrial Safety Council, Stockholm, Sweden, 327 pp.

Our planet can be divided into several ecosystems (systems that include living beings and the environment).

The set of all parts of the planet where life exists is called: the biosphere.

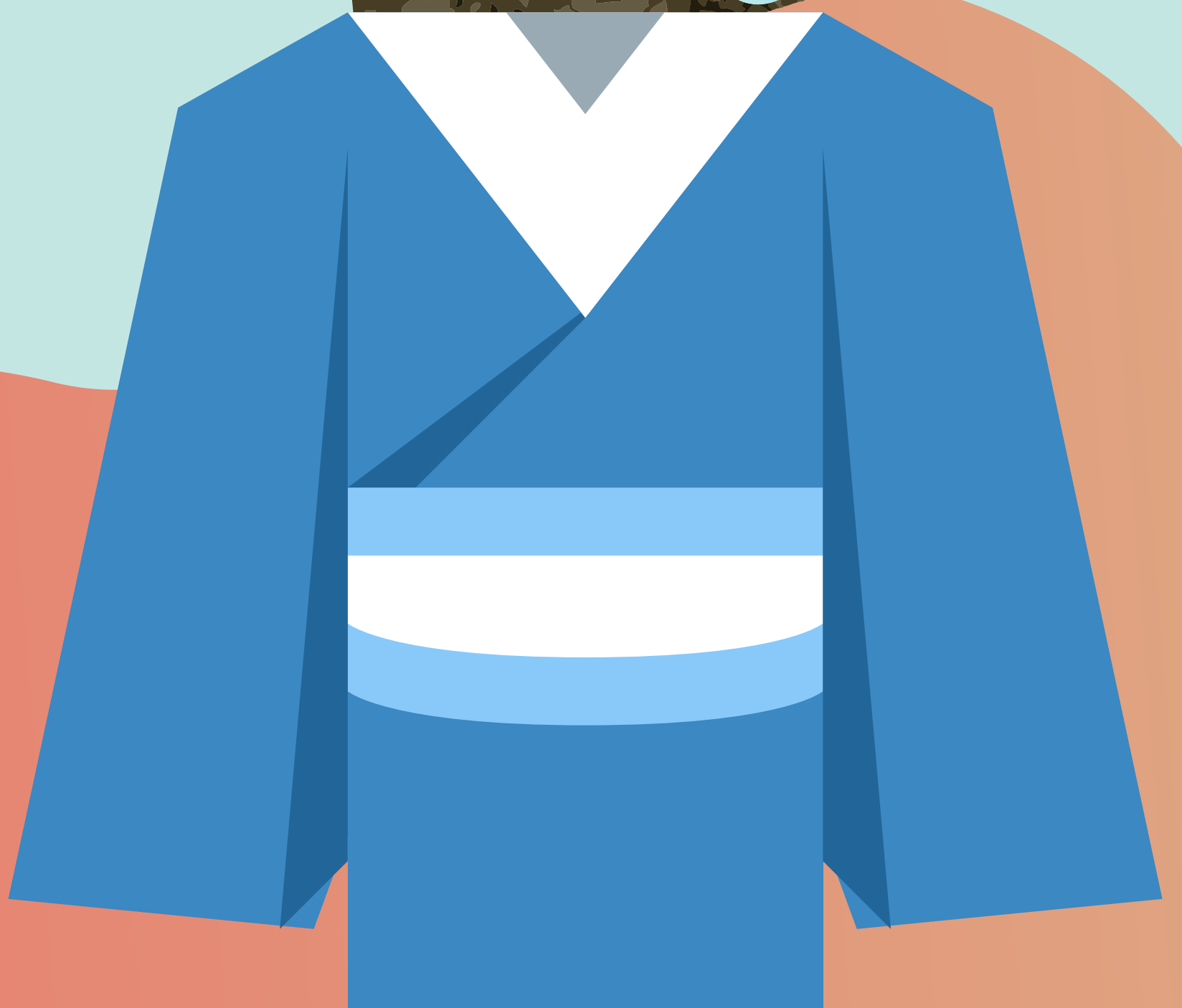
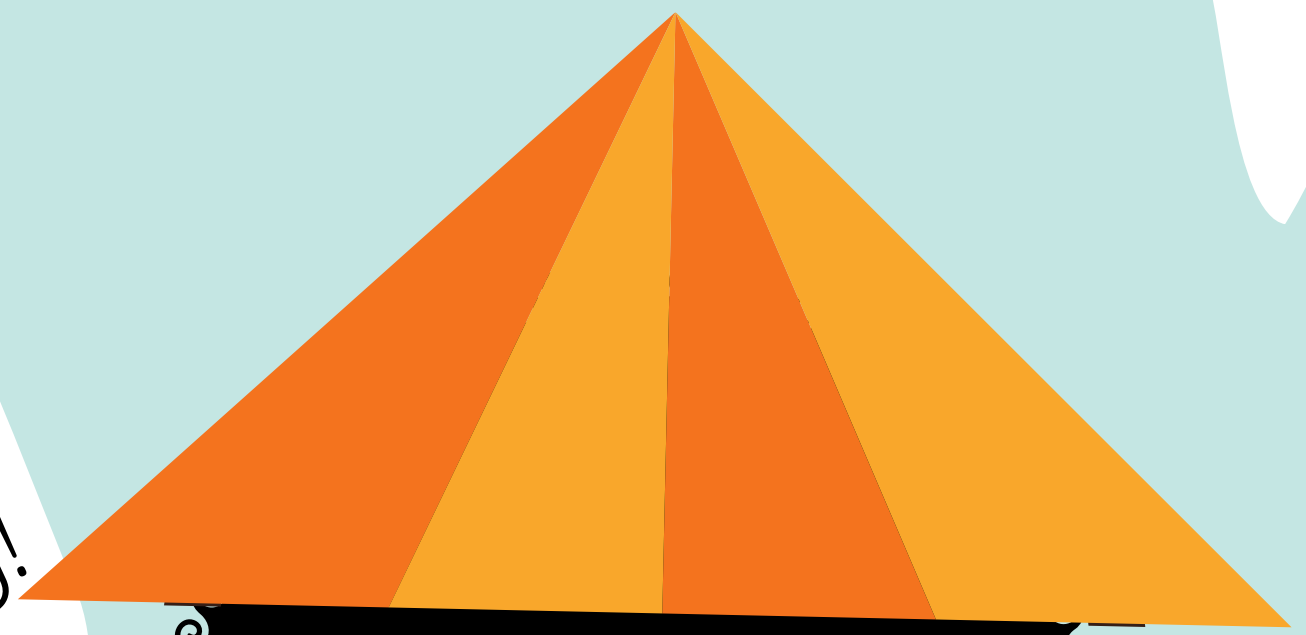


There is life in the water (hydrosphere), on the earth (lithosphere) and also in the air (atmosphere). Medical geology studies all these environments.

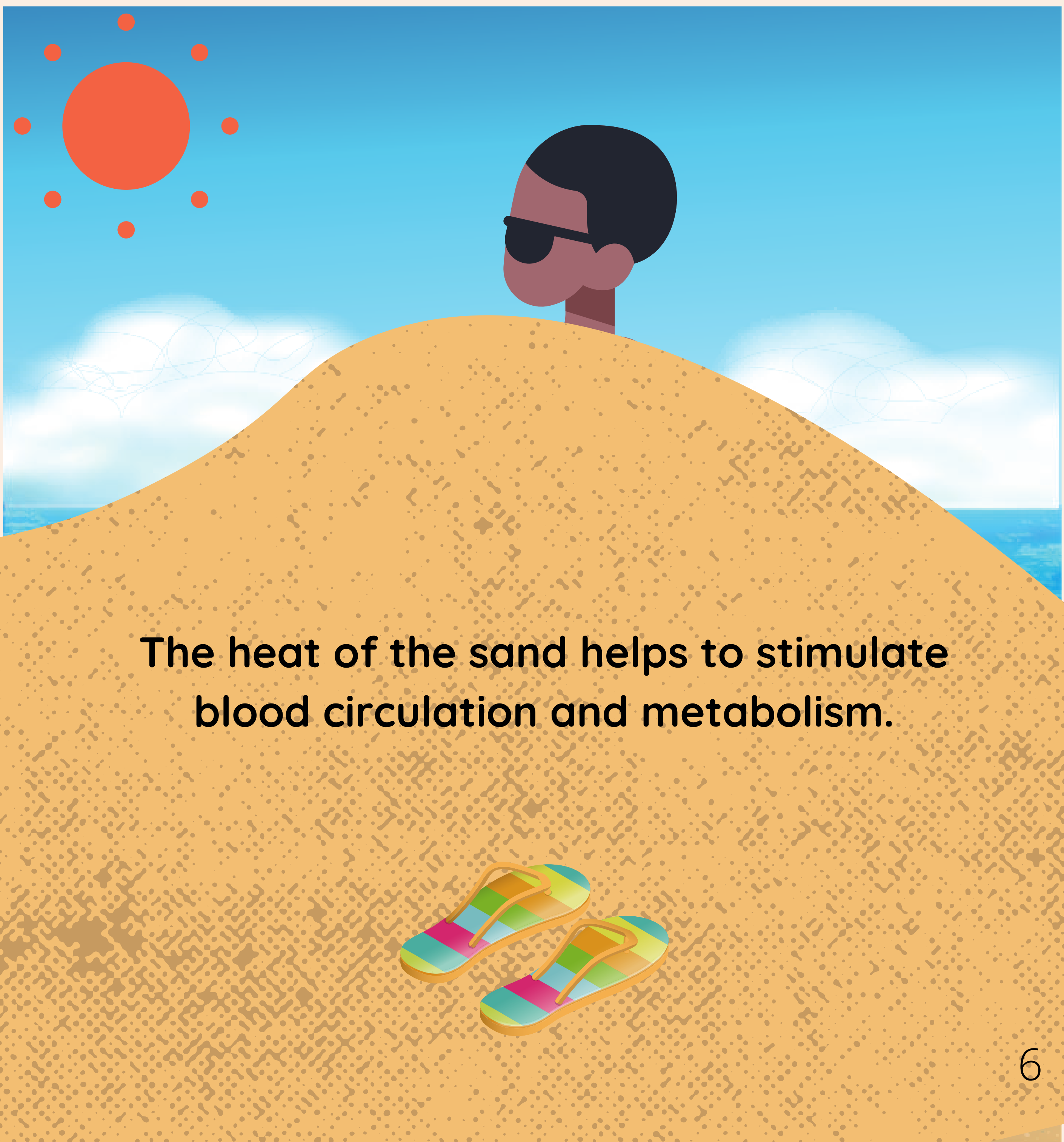


Did you know that there is a city in Japan called Ibusuki, where the sand beach temperatures are close to 50°C?

That's right!
Just thinking about this temperature I am already melting!

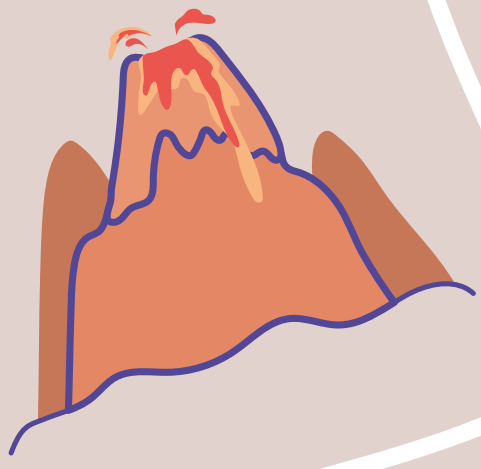


There, people take hot sand bath on the beach, so they are buried with only their heads out. The reason of this is because the heat of these beaches is good for healing many diseases, such as rheumatism, which affects the joints, muscles and skeleton.



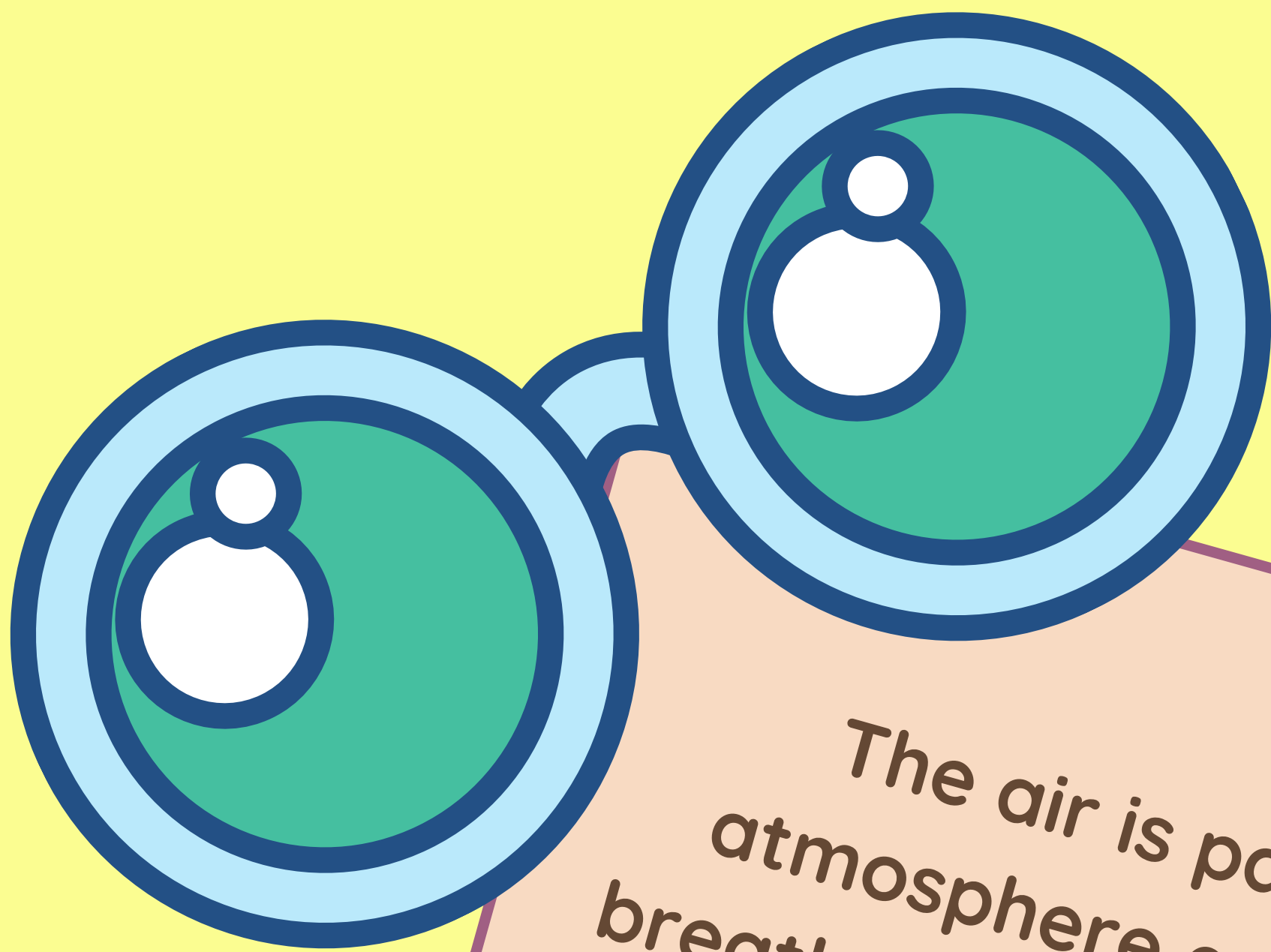
The heat of the sand helps to stimulate blood circulation and metabolism.

The explanation for the increase of the sand's temperature is that 26% of Japan's territory is formed by volcanic rocks.



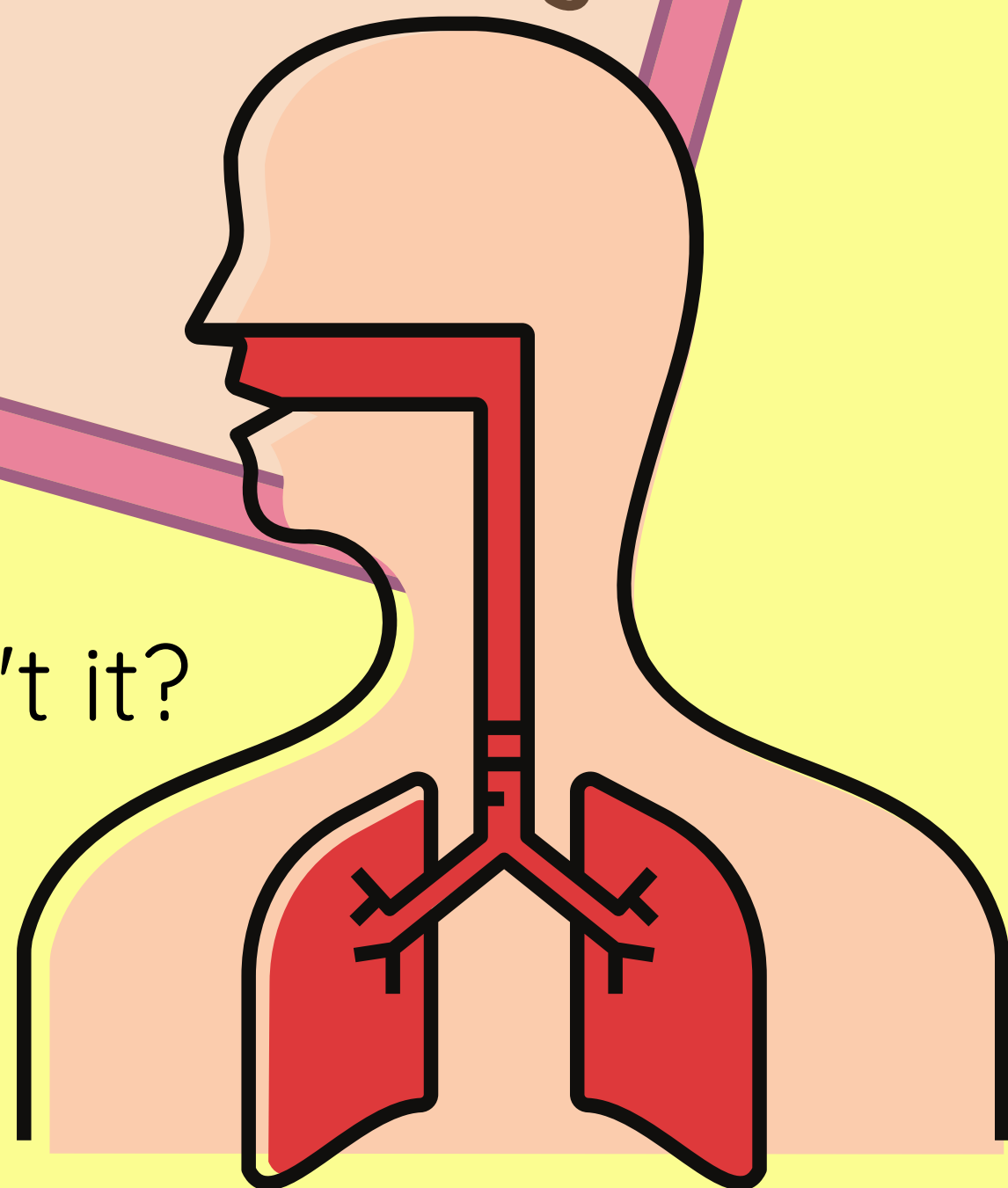
There are more than 180 volcanoes in Japan and 60 of them are active.

The temperature is high in some places because of all this volcanic activity and heats the beach sand, the rivers water and everything else there.



The air is part of the atmosphere and when we breathe, it gets in through our nose or mouth, and travels through the pharynx, larynx, trachea, bronchi until reaching the lungs.

Uow! What a long way, isn't it?



But the air has to come clean to be healthy and not harm our body.

Medical geology also studies dust and sandstorms. Have you ever heard of it?

They usually occur in regions with an arid climate, with soil covered by sand, clay and other sediments.



Winds over 40 km/h can raise all this dust and reach everything and everyone around.




Can you imagine if all this dust could reach our lungs? It could cause diseases of the respiratory system, such as asthma.



We should always breathe clean and pure air, mainly avoid breathing the pollution of the buses and trucks which ride on our roads and cities.

Now pay attention, I'm going to ask a very important question!



What kind of mineral resource do we have to consume every day, and which makes up about 70% of our body?

Let the drums roll:

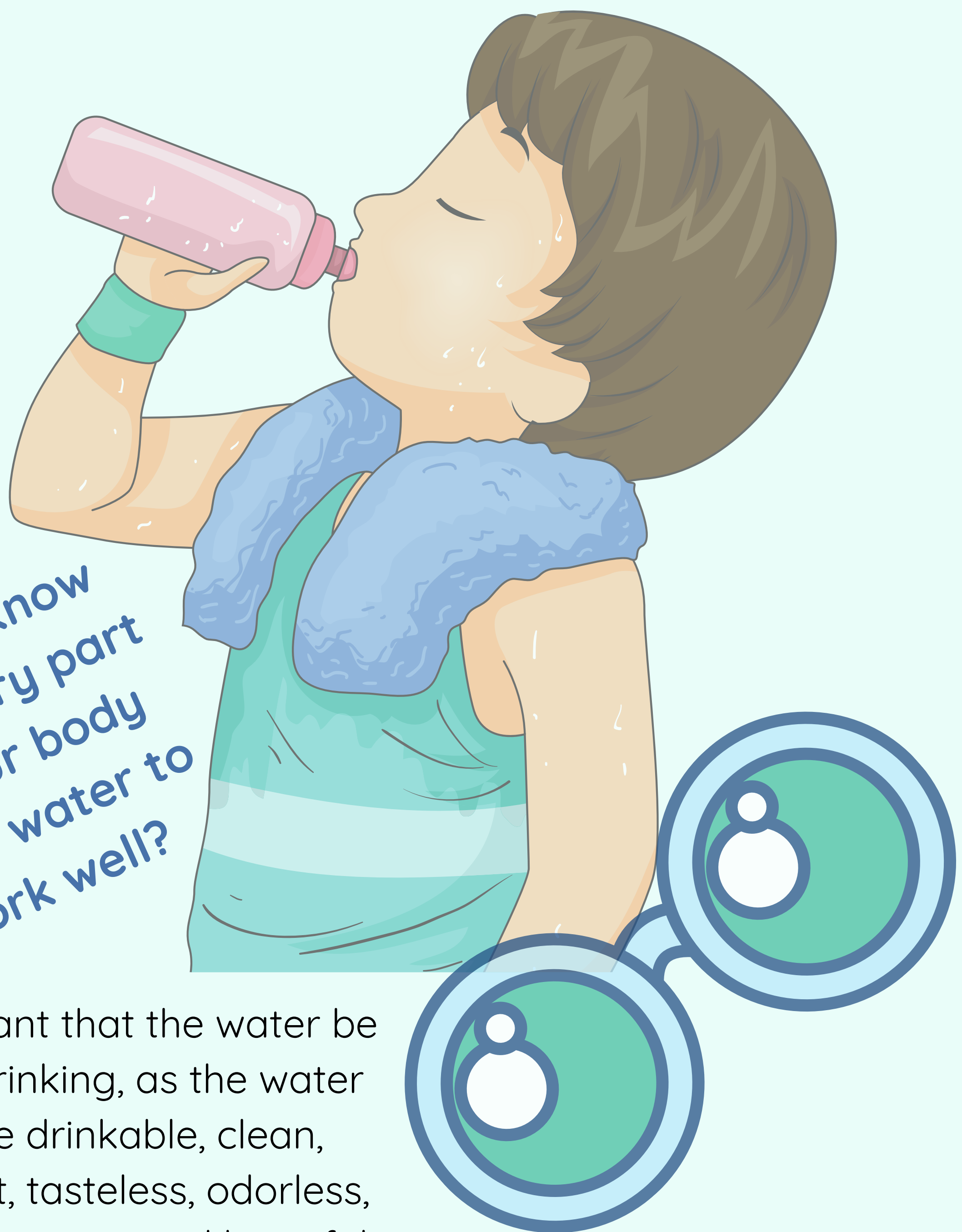
Tum tum tum tum



*Well done my friends, if you answered that it is **water!!!***

Hope you drink plenty of water every day.

Please, research the amount of water* you might drink daily.

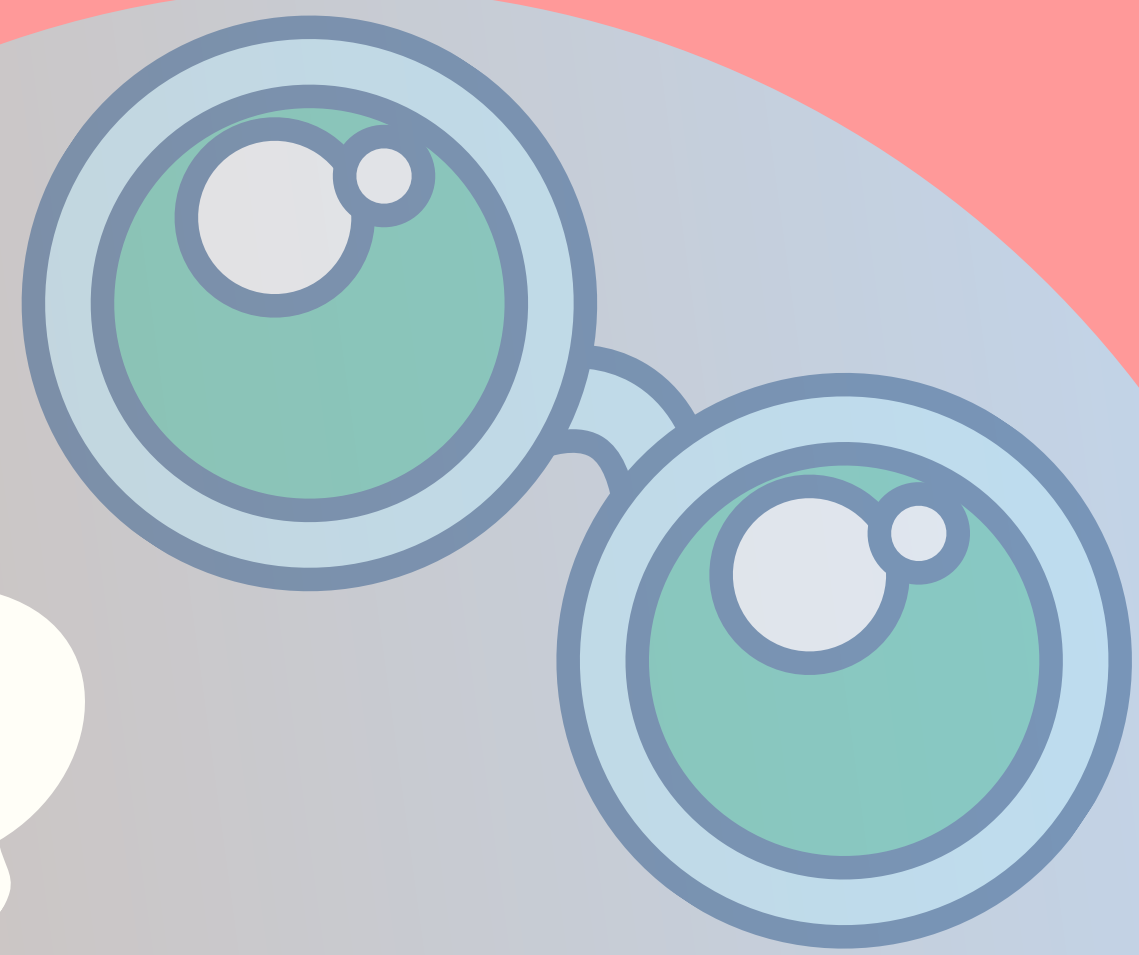
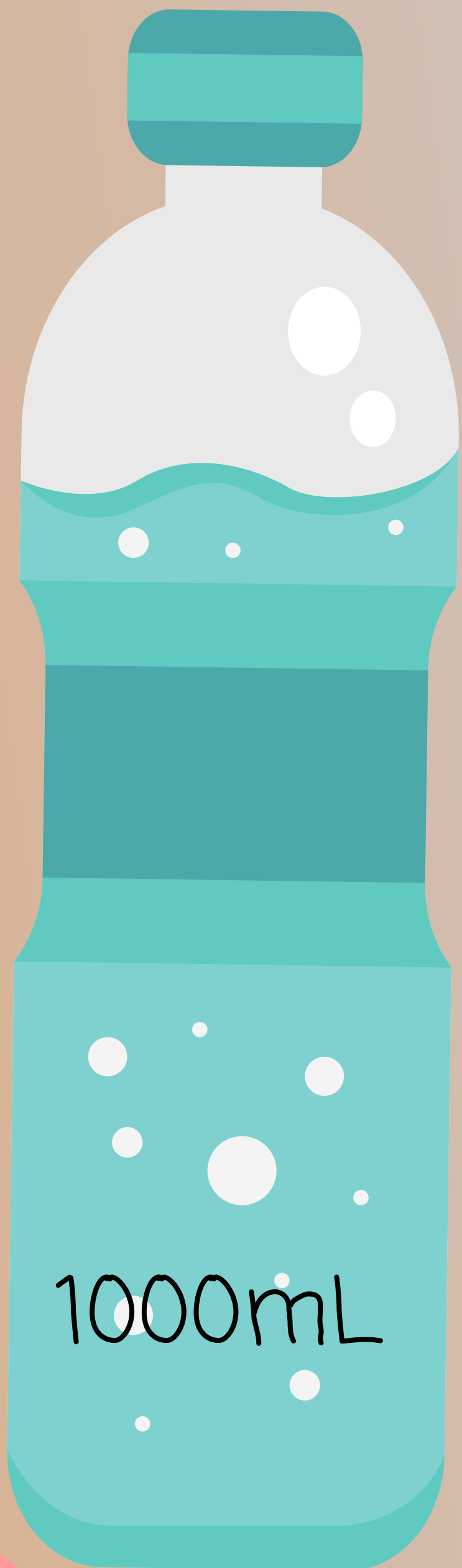


Did you know that every part of your body needs water to work well?

*It is important that the water be good for drinking, as the water should be drinkable, clean, transparent, tasteless, odorless, free from bacteria and harmful elements for health.

Have you ever thought about where does the water we drink comes from?

If you could put all the water in the world in a 1 liter bottle, we would have:



97.3% (almost the entire bottle) of sea water, which is salt water, and only 2.7% fresh water (the water we drink), that would fit in a tiny cup of coffee.

Wow... it's a lot of sea water, isn't it?

Just a tiny cup of fresh water?

From this 27 ml tiny cup, which represents the fresh water in the 1000 ml bottle, we would have about 22 ml of ice (frozen water from the poles) that we cannot drink.



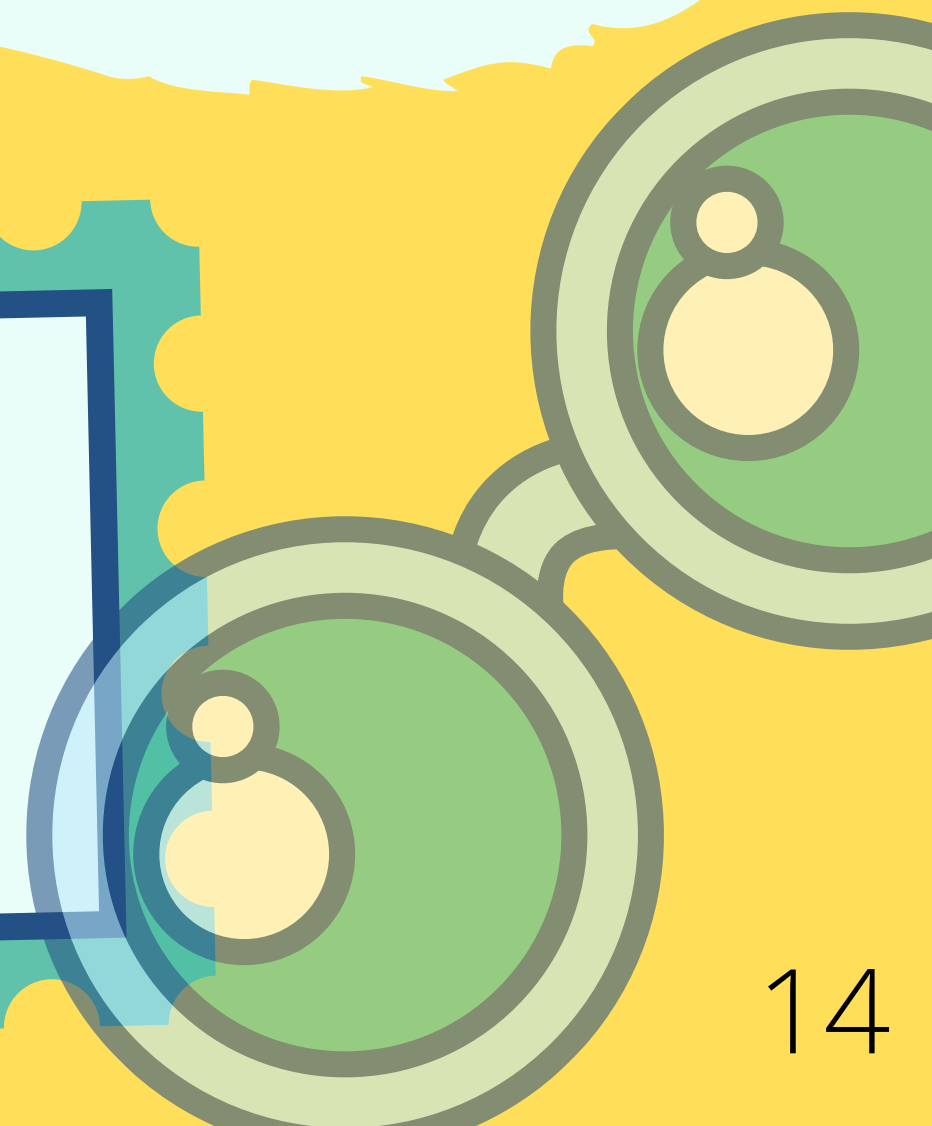
Imagine, the 1000 ml bottle represents all the water on the planet and only 6 ml is a proper water to drink and use everyday.



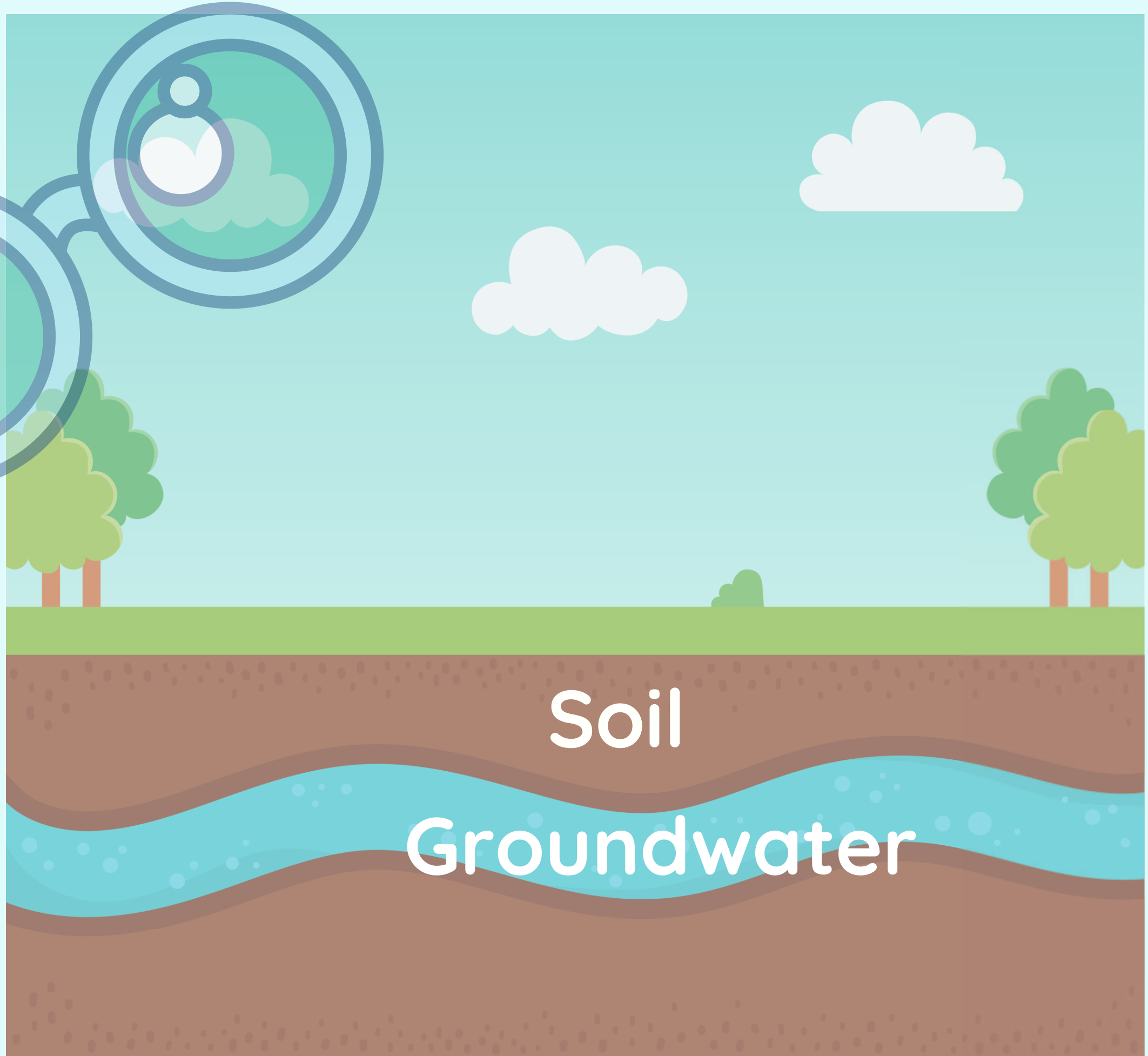
The rivers, lakes, dams, weirs etc., that is, **the Surface Water** (the water on the surface of the Earth) represents only 0.1 ml which is just 2 drops remaining of our 6 ml left.



So, where is the great amount of water we drink and use daily?



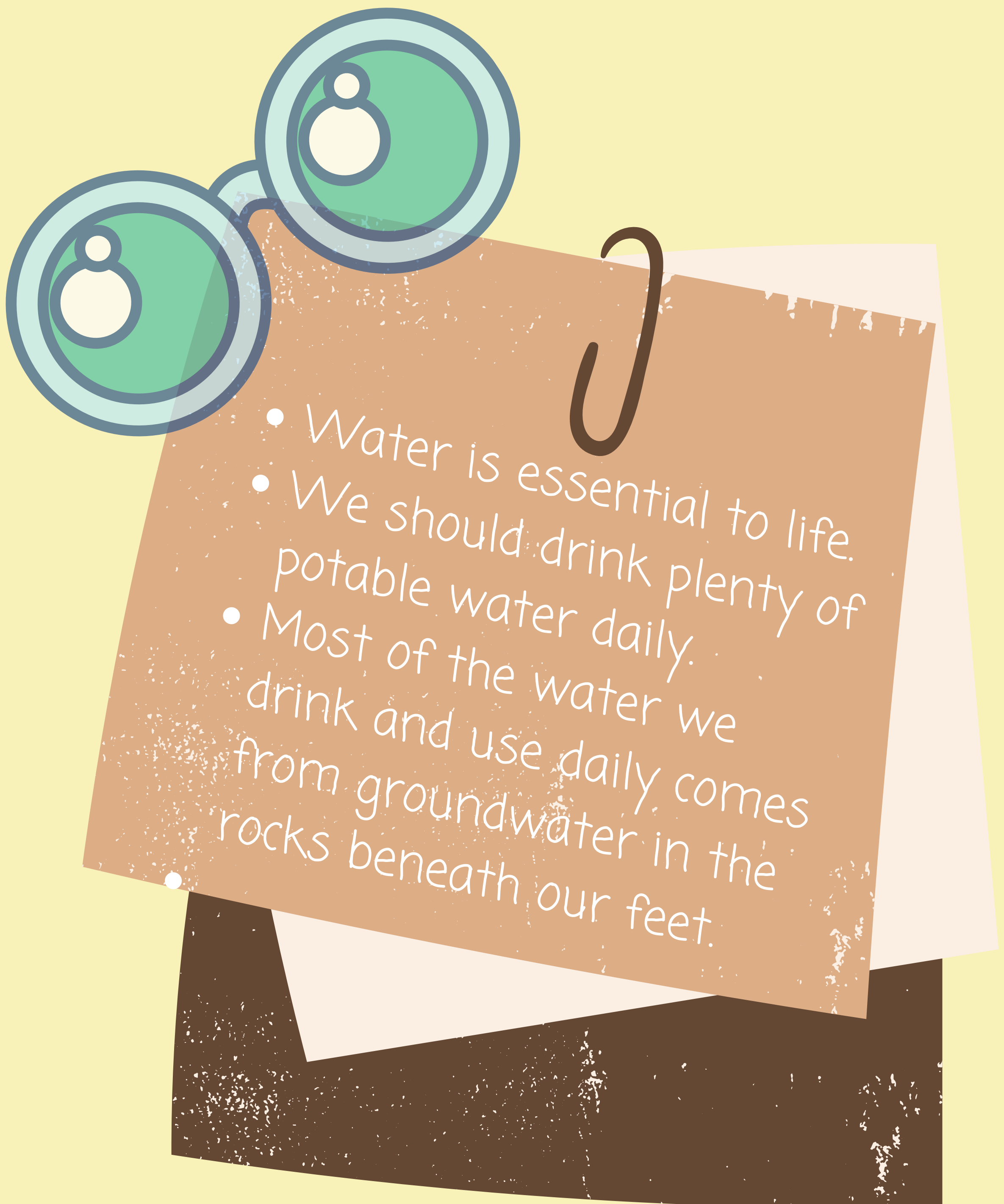
Whoever answered that most of the water we use is in groundwater, which is under the ground, was right!!!!



Underneath the ground there are many layers of soil and rock. The groundwater passes through these layers.



Well, going back to medical geology, we can now summarize our study of water.



Now I'm going to present you another example of a medical geology study.

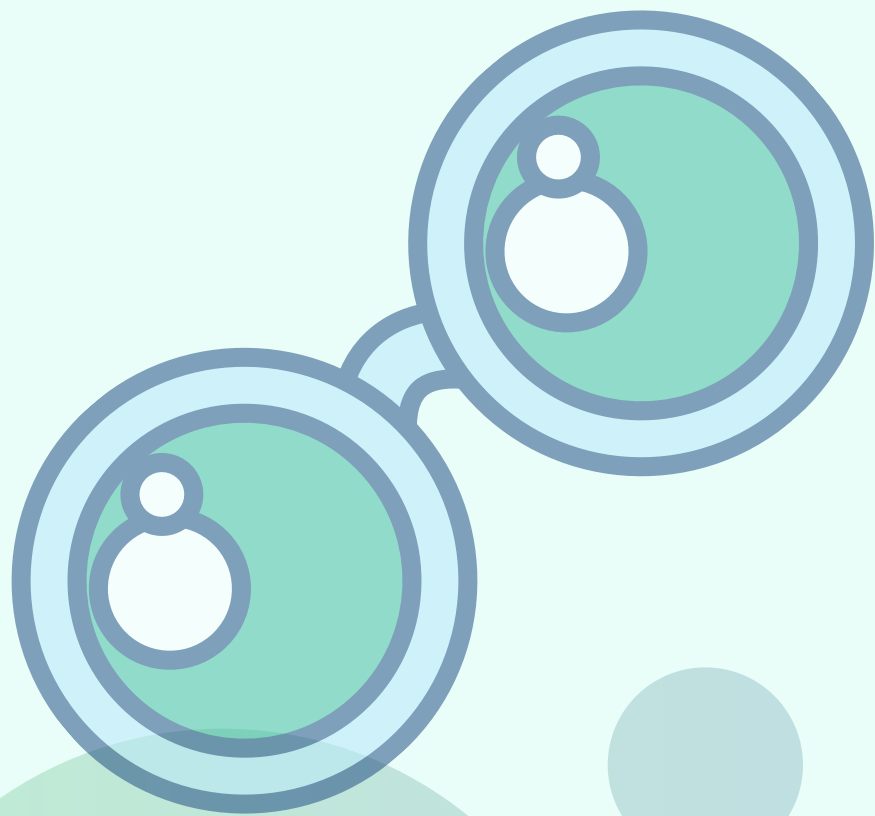
There is a city in Brazil, which is in the north of the State of Minas Gerais, called São Francisco. This city is 536 km from the capital, Belo Horizonte.



There was an increase in the number of wells to extract underground water in the 1970s, mainly in rural areas of these city.

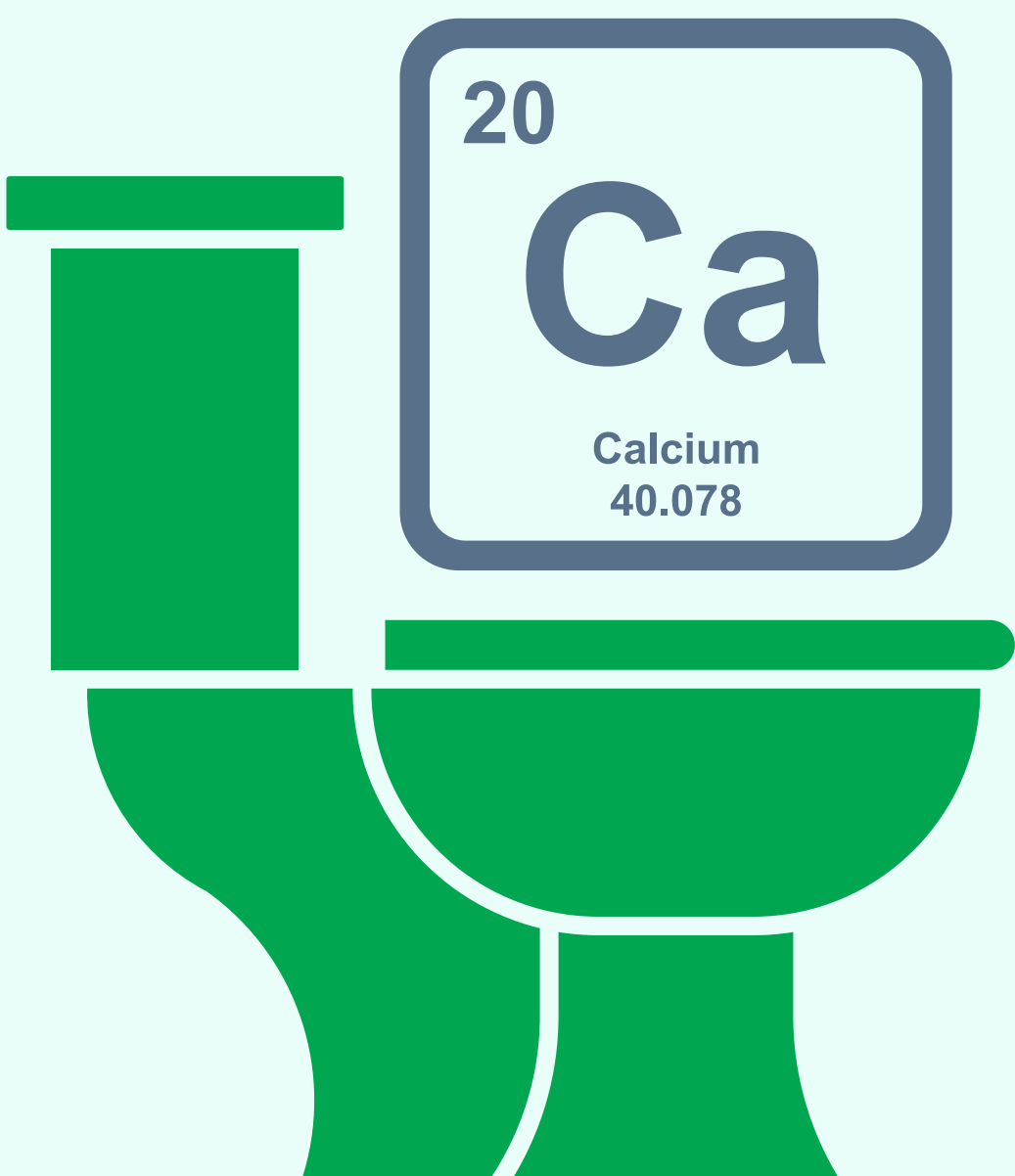


Over time, there has been a large increase in the number of people with a disease called **Dental Fluorosis**.



Fluorosis is a disease caused by the **excess of fluorine in the body**.

Fluorine is a chemical element, represented by the letter **F**.



When our body has a lot of fluoride, it joins with the element calcium, which exists in teeth and bones, so, **the calcium is eliminated in the urine**.

So as we are low on calcium in the body, then the teeth are stained white to light brown. **This is Dental Fluorosis.**

When the amount of fluorine increases even more in the body, the amount of calcium lower a lot, then it starts to reach the bones as well, causing **Skeletal Fluorosis.** This disease causes pain and damages bones and joints.



But what would be the cause of this disease?

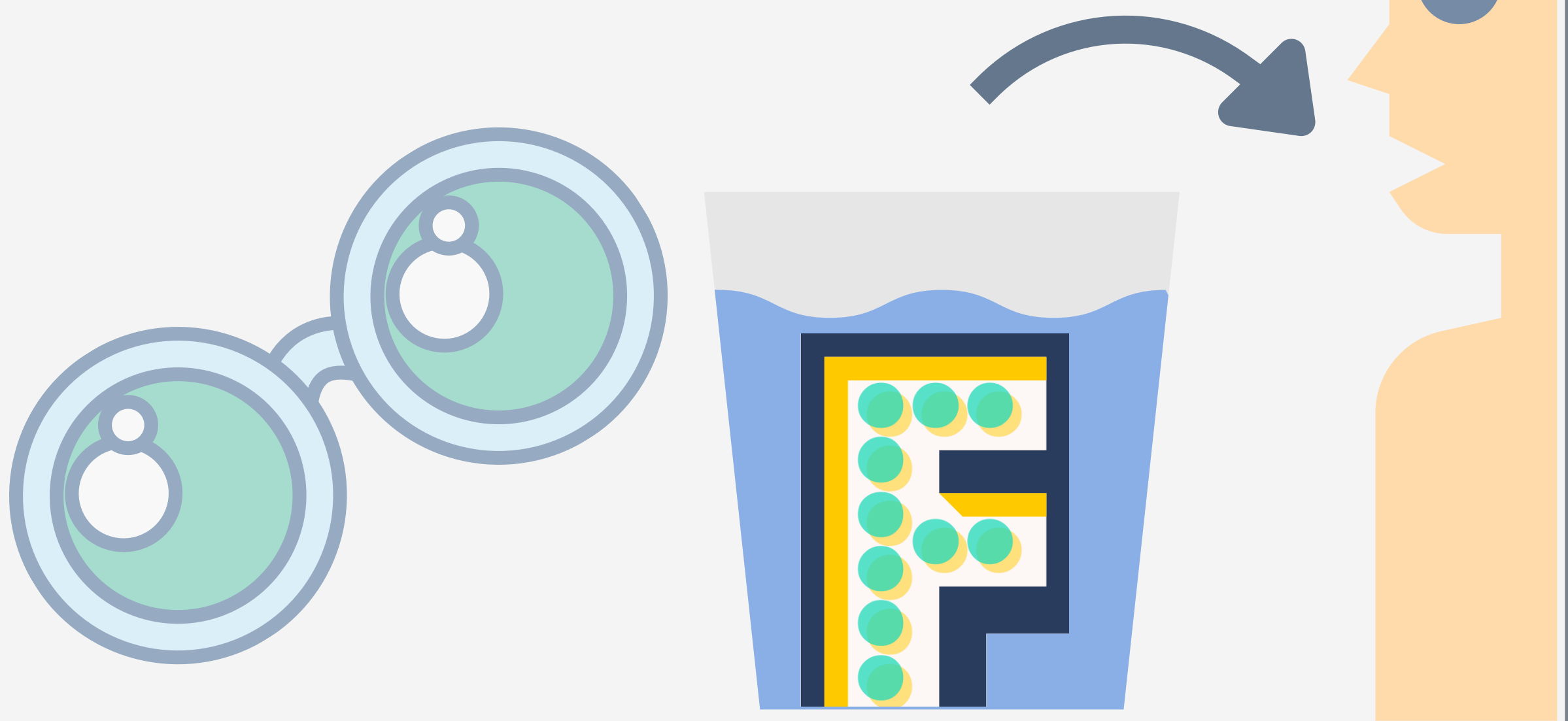


To solve this issue, the UFMG (Federal University of Minas Gerais) prepared a project*, which had the participation of several researchers, including geologists and dentists, to work together on this mystery.



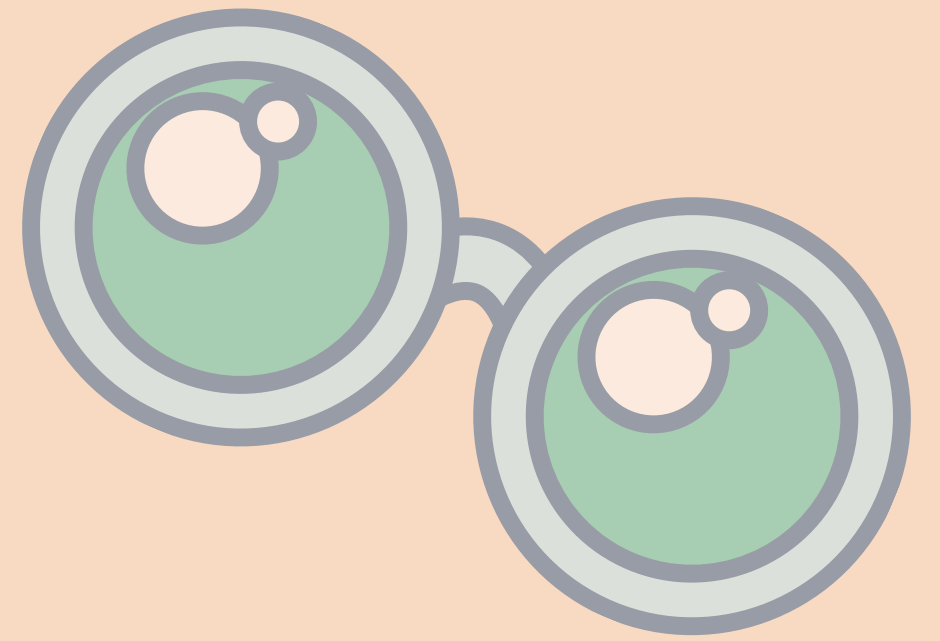
- VELÁSQUEZ, L.N.M. et al. Origem do flúor na água subterrânea e sua relação com os casos de fluorose dental no município de São Francisco, Minas Gerais. Belo Horizonte, 2003. 169p. Relatório de Pesquisa FAPEMIG.

There, in San Francisco, in rural areas, the wells extracted groundwater that was in contact with a very fluorine-rich mineral called **Fluorite**. This mineral has been dissolved and released the fluoride into the water, which had been ingested by the population.

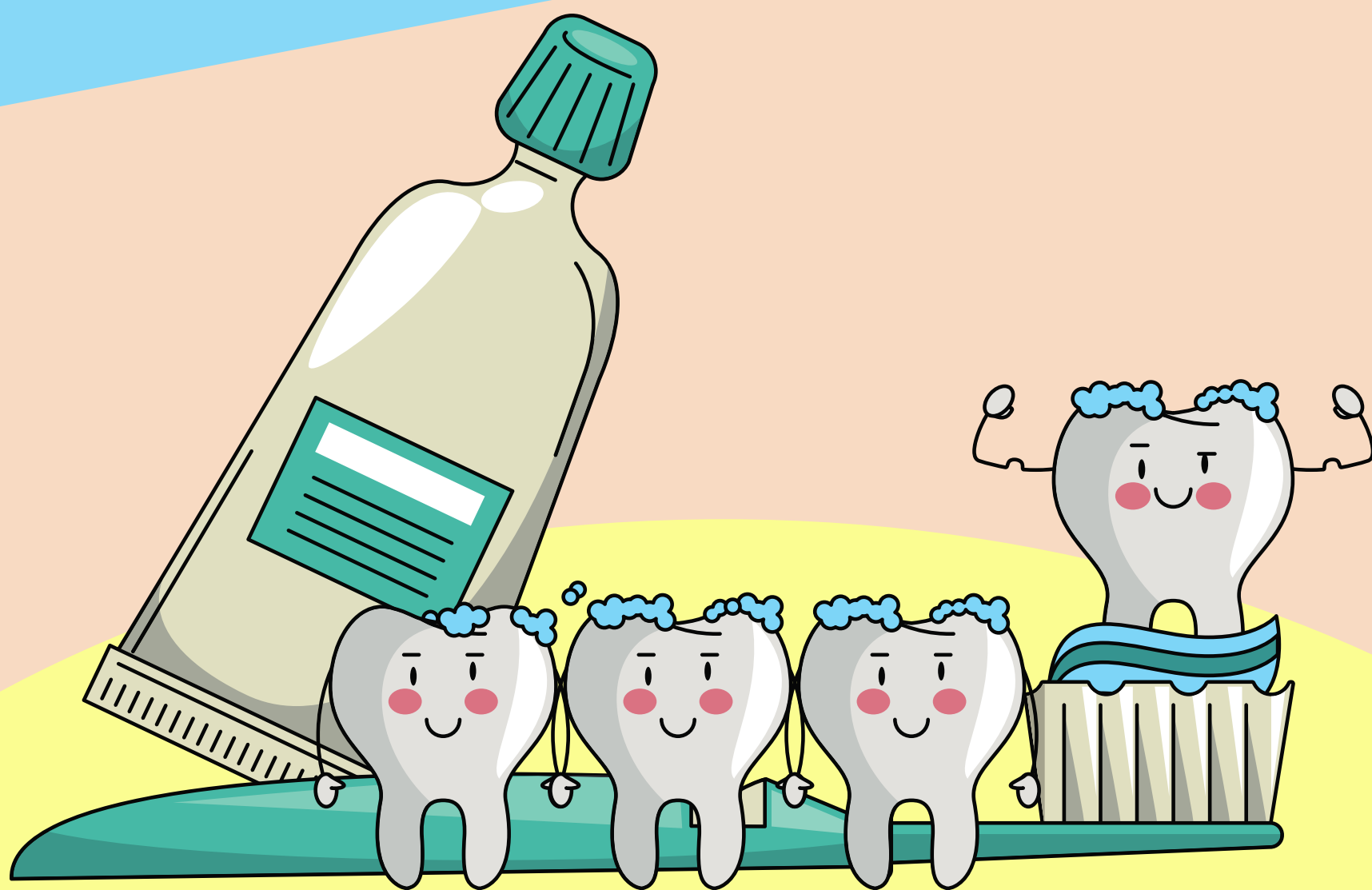


This natural contamination occurred over a long long time. The population was exposed over a long time too, drinking the contaminated water every day and, because of it, many people had Fluorosis. Children were the most affected and even later, when the baby teeth fell out, the permanent teeth were born stained with Fluorosis.

My “**heart**” was sad when I found out that many local people were ill with **Dental Fluorosis**.



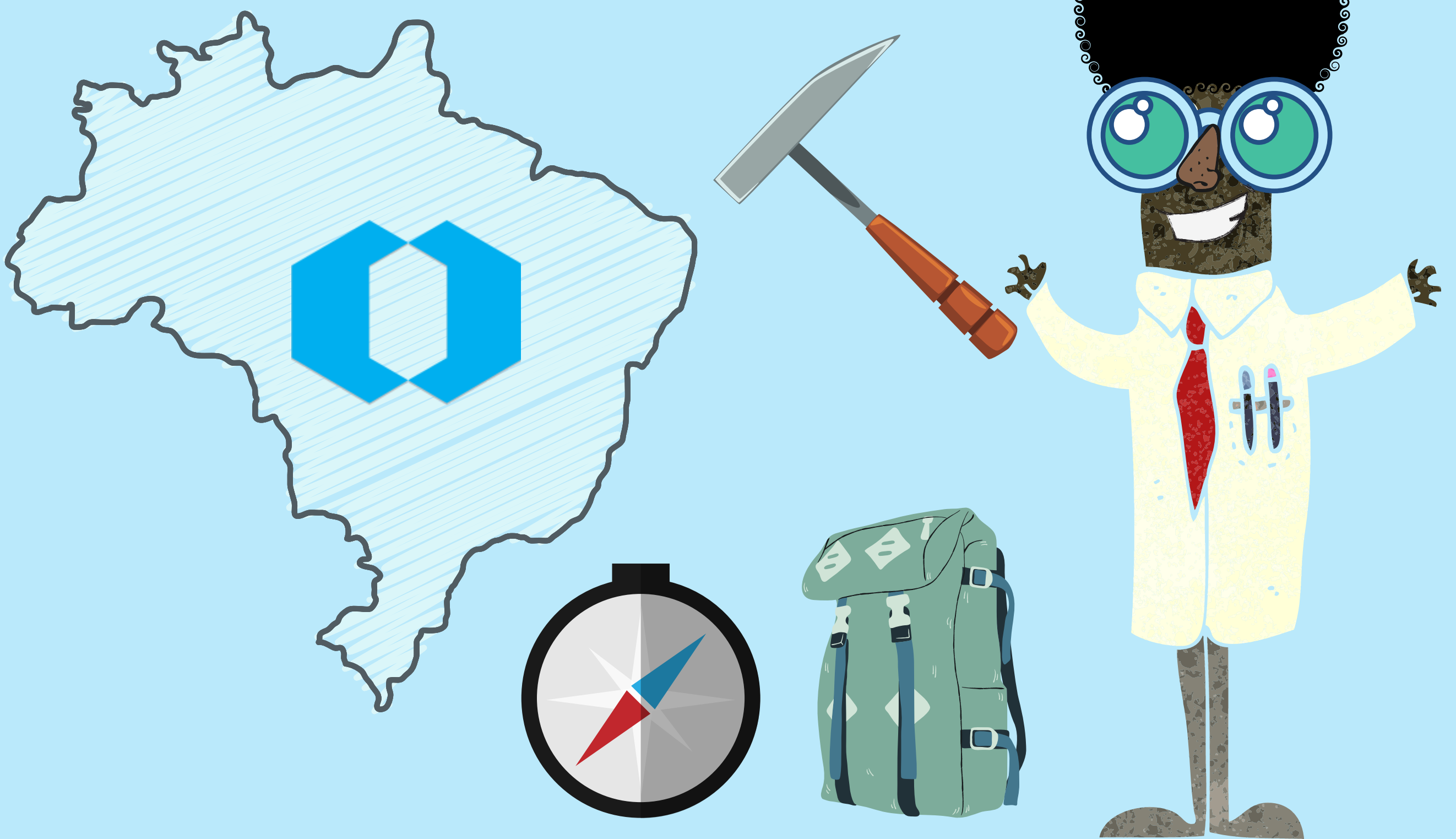
We must ingest fluorine in the right amount, as the lack of it can lead to cavities, but in excess it is also bad. Use the right recommendation!



But there are solutions to this problem, such as drilling wells in places where the groundwater does not have fluoride in excess. A geologist will certainly be able to help you to find the ideal place!

Well my friends, I am happy to know that professionals who study **Medical Geology** continue to do a lot of research around the world and discover the cause of many diseases.

In Brazil, the **Geological Survey of Brazil** is the one that conducts medical geology research.



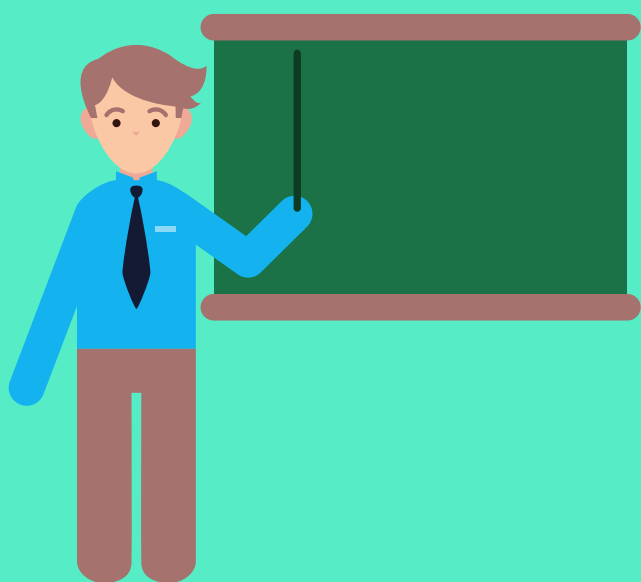
If you want to know more about the subject, visit the website **www.cprm.gov.br** and search for “**Medical Geology**”.

Finally, I've got an important question for you:

Have you ever thought of a profession to practice when you grow up?

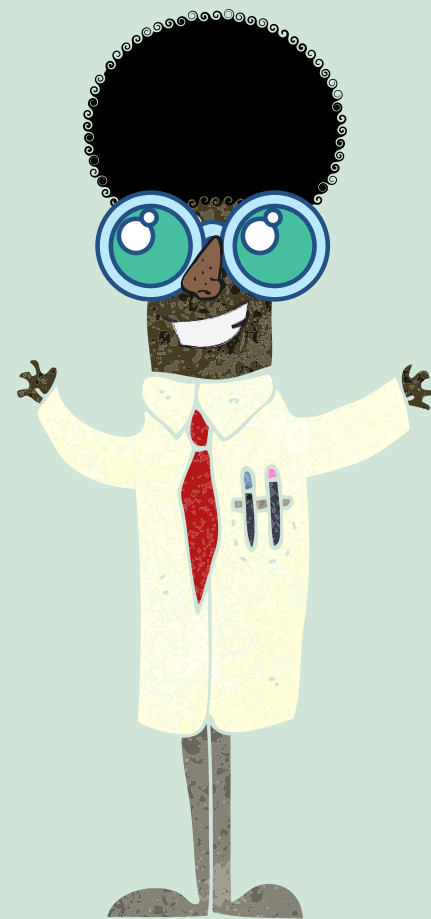


You will surely choose one that is of great service to humanity.



I'd like to say goodbye asking you to take good care of your health and the environment!

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