TVP M

EARTH

BY TIO

special

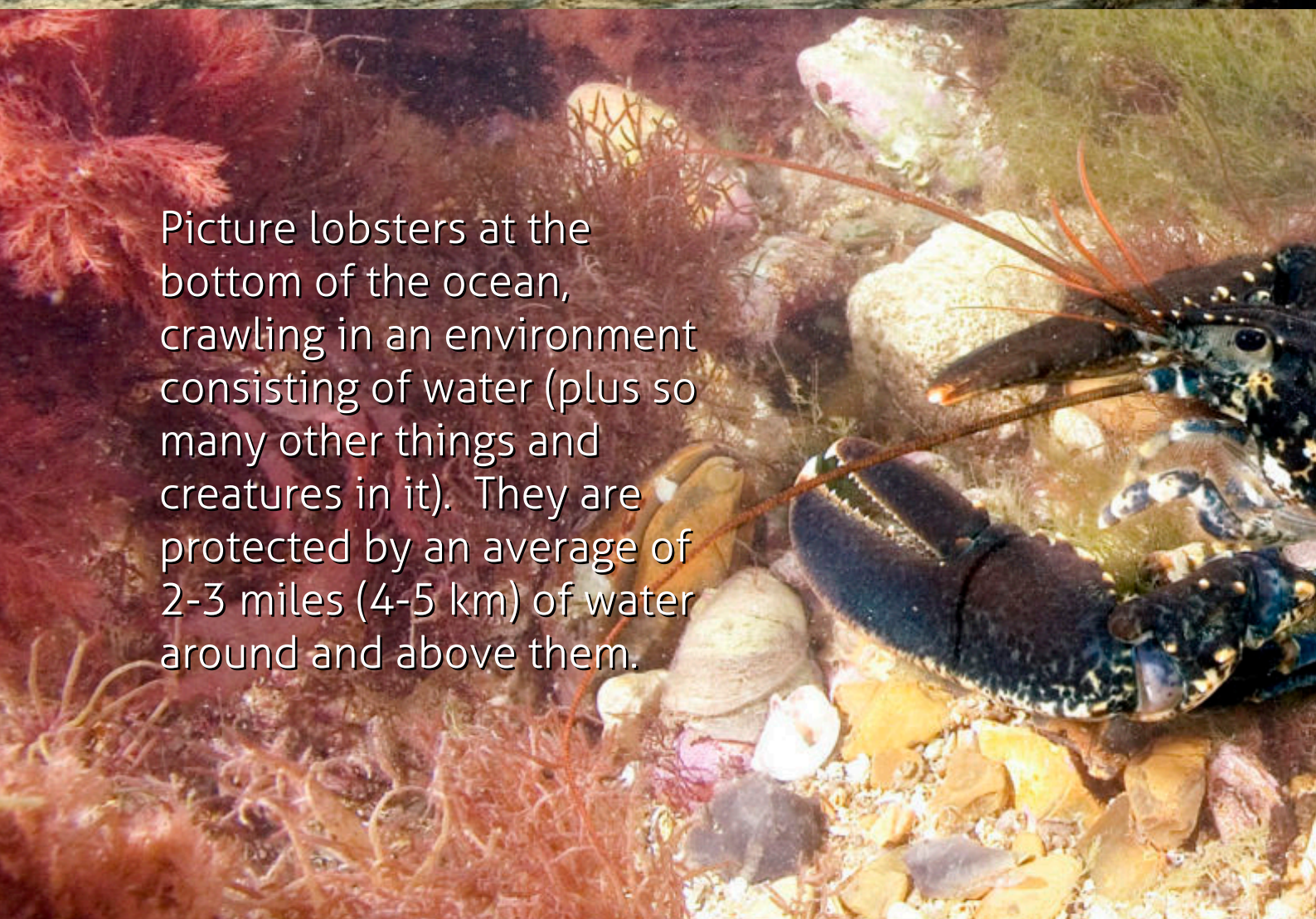
We are 'glued' to a huge sphere by gravity, protected by a 62 mile (100 km) 'blanket' of particles that we call 'our atmosphere'. We orbit one of the billions of stars in our galaxy, which is one galaxy among billions of others in, perhaps, just one of many universes out there.

There are many 'worlds' in our solar system; some full of ice, some full of volcanoes. So far, and within a very short period of time, there have been around 2000 planets identified outside of our solar system, many light years away, and none seem to possess such characteristics as ours. It's hard to tell though, as these worlds are too far away to know that much about them so soon. At least in our solar system, Earth is indeed unique, a word that doesn't do justice for such a complex world that we inhabit.

OUR HOME

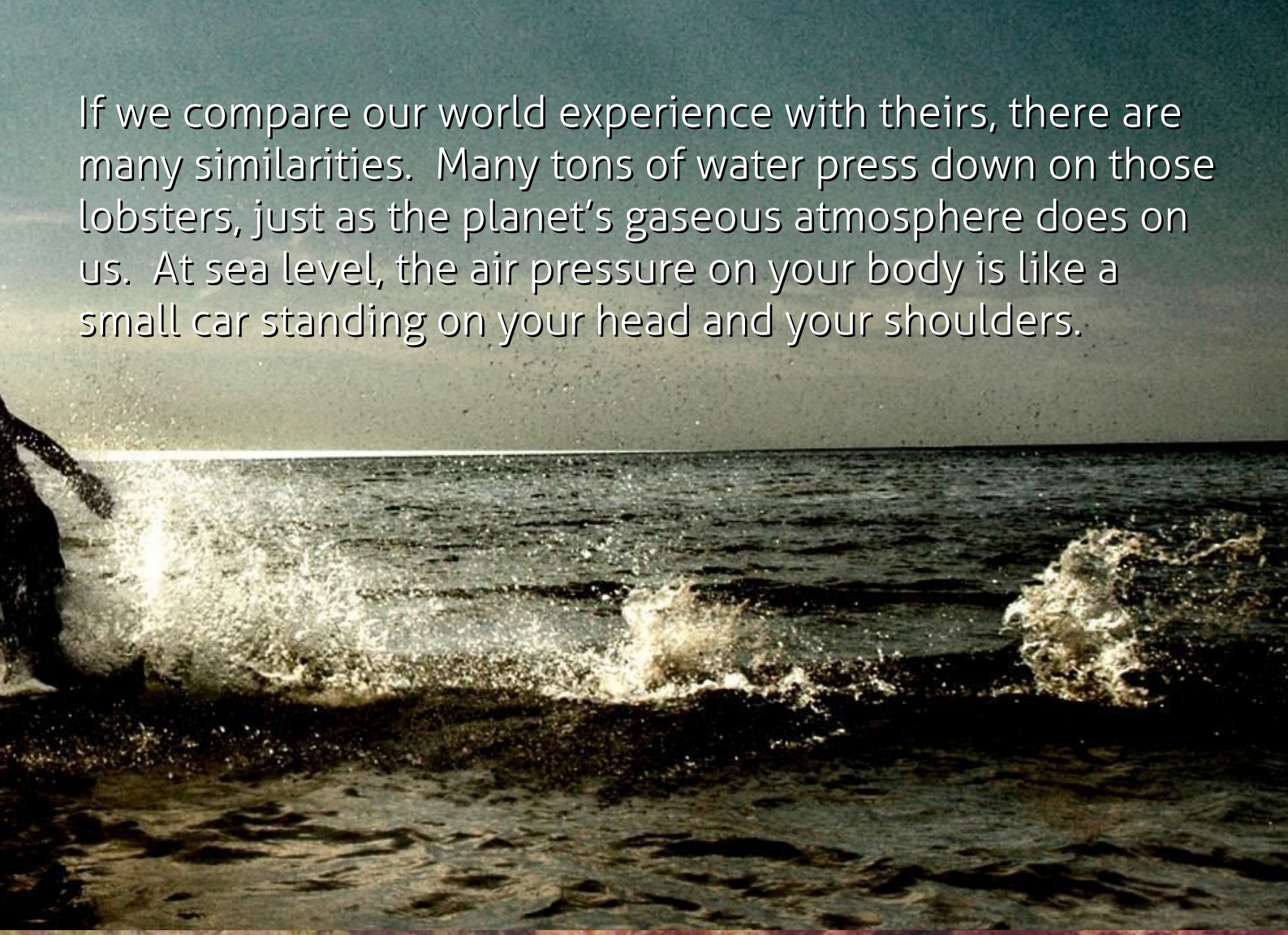
In a four-part series, starting with this one, we will showcase some extraordinary features of our sphere, our planet, our world, our home. If we can realize just how incredibly lucky we are to inhabit this place, and how devastating an effect it will be if we are not careful with how we manage things here, our drive to make our human society smarter, in order to further explore, protect and truly enjoy this world, will increase exponentially. I dare to say 'our' world, because we have to understand that if we cause changes to the global ecosystem, we could easily perish as a species. This is why we have to be very careful about how we live, explore, and thrive.

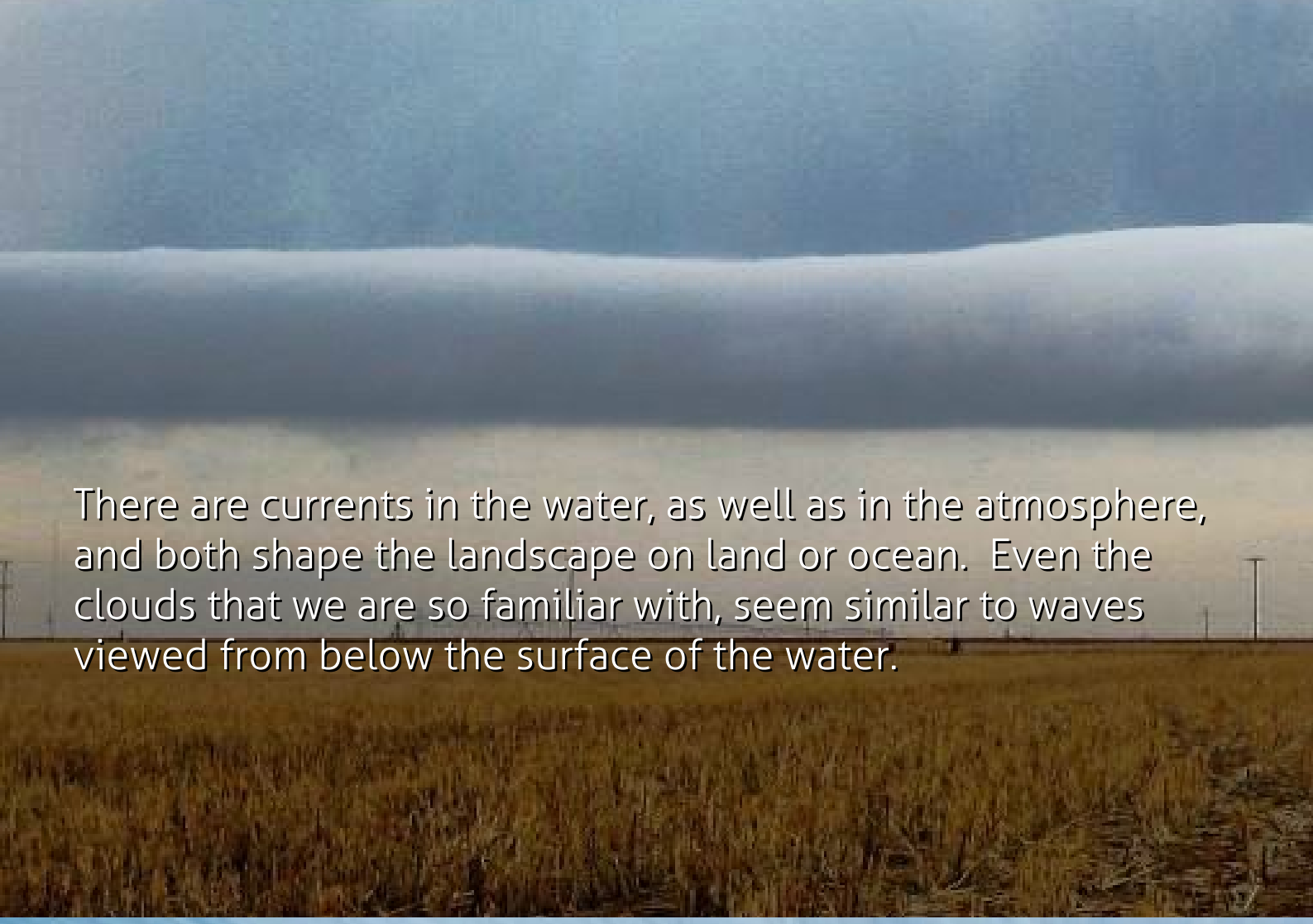
In this first article, we will try to understand the concept of 'home'. Why Earth is 'our home', and why it is so important.



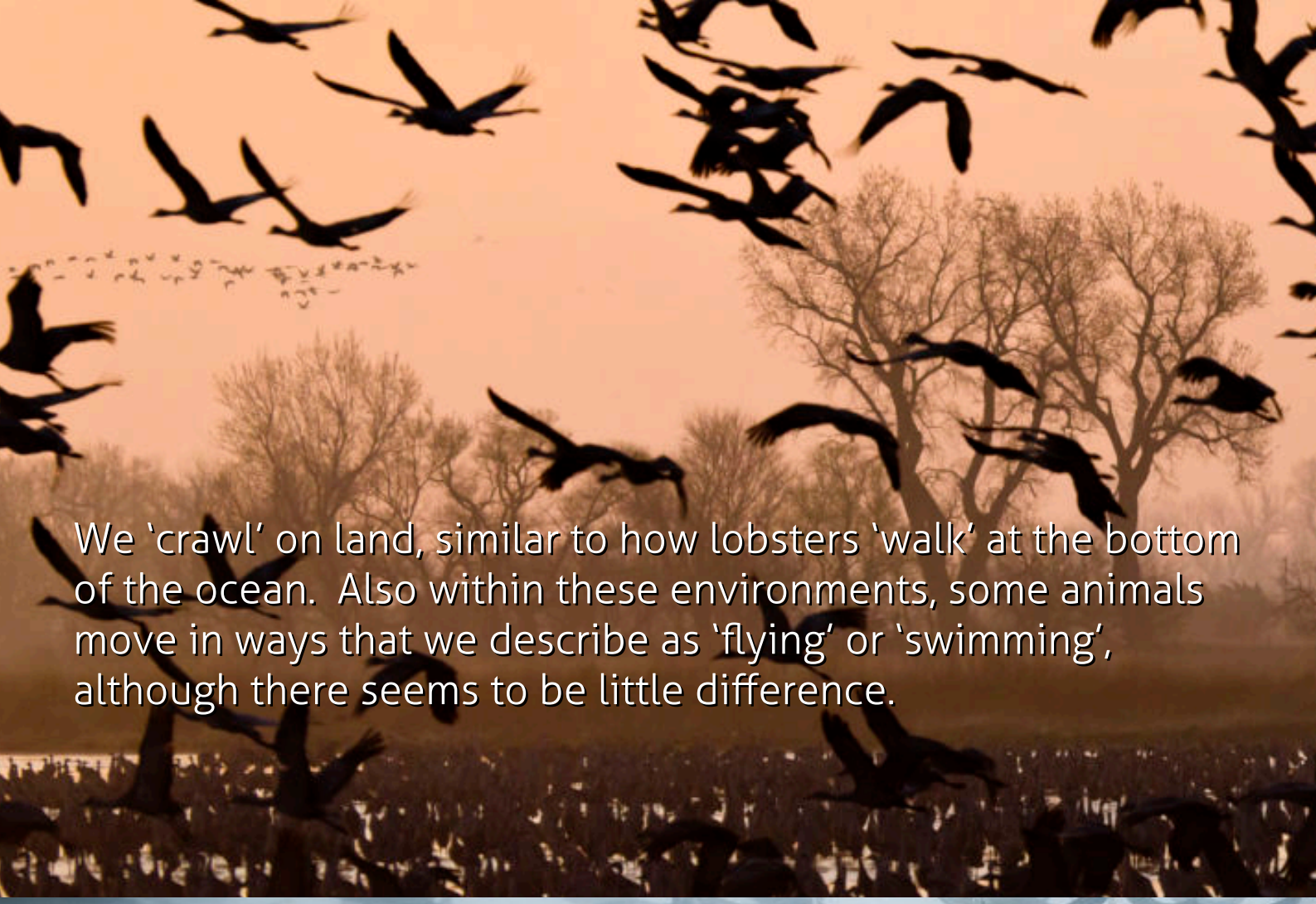
Picture lobsters at the bottom of the ocean, crawling in an environment consisting of water (plus so many other things and creatures in it). They are protected by an average of 2-3 miles (4-5 km) of water around and above them.

If we compare our world experience with theirs, there are many similarities. Many tons of water press down on those lobsters, just as the planet's gaseous atmosphere does on us. At sea level, the air pressure on your body is like a small car standing on your head and your shoulders.





There are currents in the water, as well as in the atmosphere, and both shape the landscape on land or ocean. Even the clouds that we are so familiar with, seem similar to waves viewed from below the surface of the water.

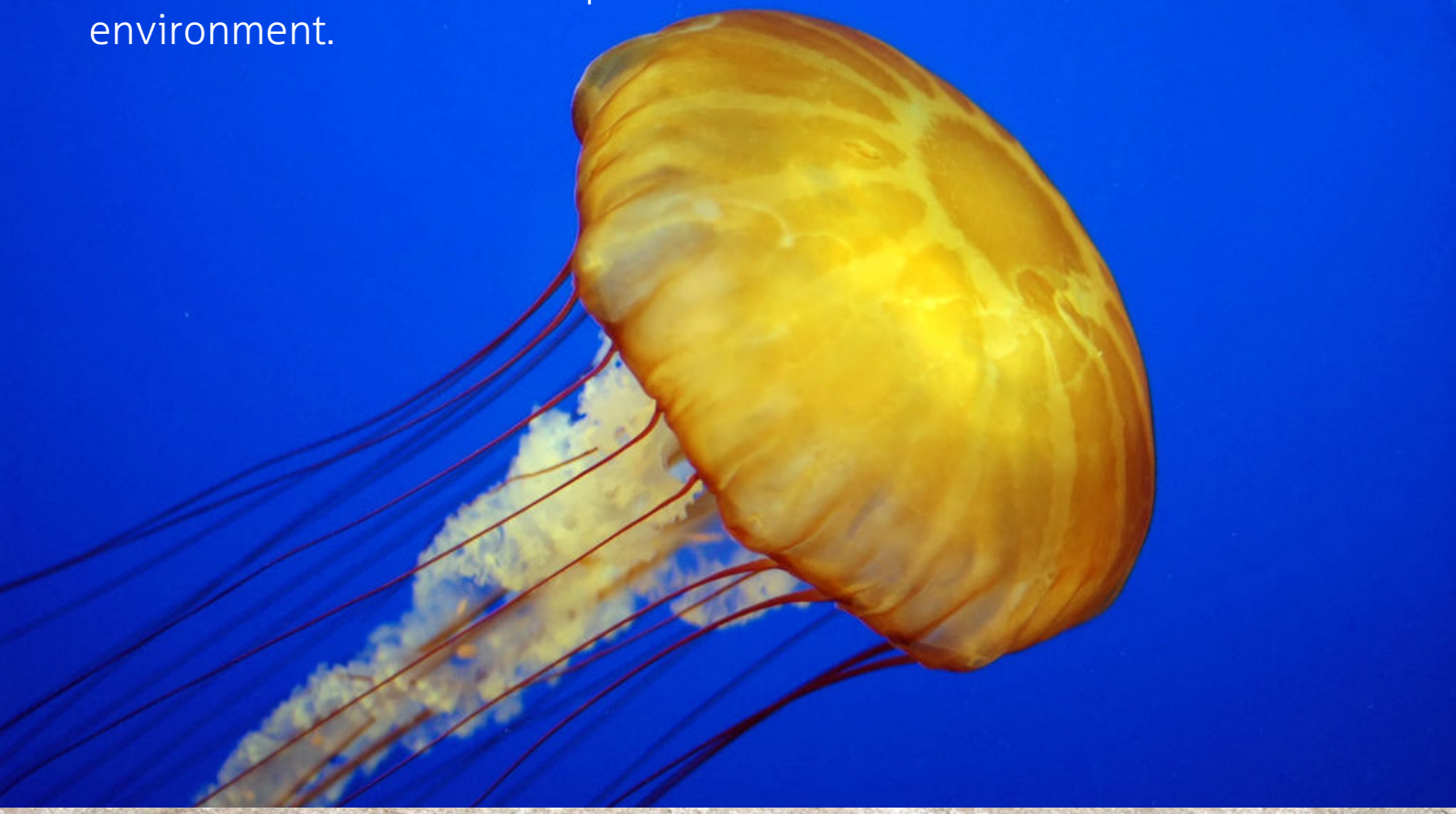


We ‘crawl’ on land, similar to how lobsters ‘walk’ at the bottom of the ocean. Also within these environments, some animals move in ways that we describe as ‘flying’ or ‘swimming’, although there seems to be little difference.

If a lobster comes out of the water, it can survive for a couple of days, after which it will suffocate. A lobster can extract oxygen from the air, but in order to do this, its gills must be kept moist or they will collapse. The lobster's 'home' is in the ocean.

If we were to take a different animal from the water environment, let's say a blue whale, and bring it to our land environment, the whale will only survive for a matter of minutes (maybe hours). Its body is so massive that being out of water will crush many of its internal organs.

A jellyfish on land looks nothing like a jellyfish in the water, not to mention that it's not alive anymore. Check out this video of an octopus crawling onto a shore. Notice how oddly this animal moves in a different environment than his own, not to mention that this one would also have died if it spent too much time outside of his own environment.



If you want to take a fish out of the ocean, you have to put it in a water tank and feed it with proper fish food. However, that is not all that's needed to keep that fish alive. You need to constantly recycle & clean the water so that dangerous chemicals (toxic for the fish) won't kill it.

The temperature of the water is also crucial. Allow it to get too hot or too cold and the fish will not be able to survive.

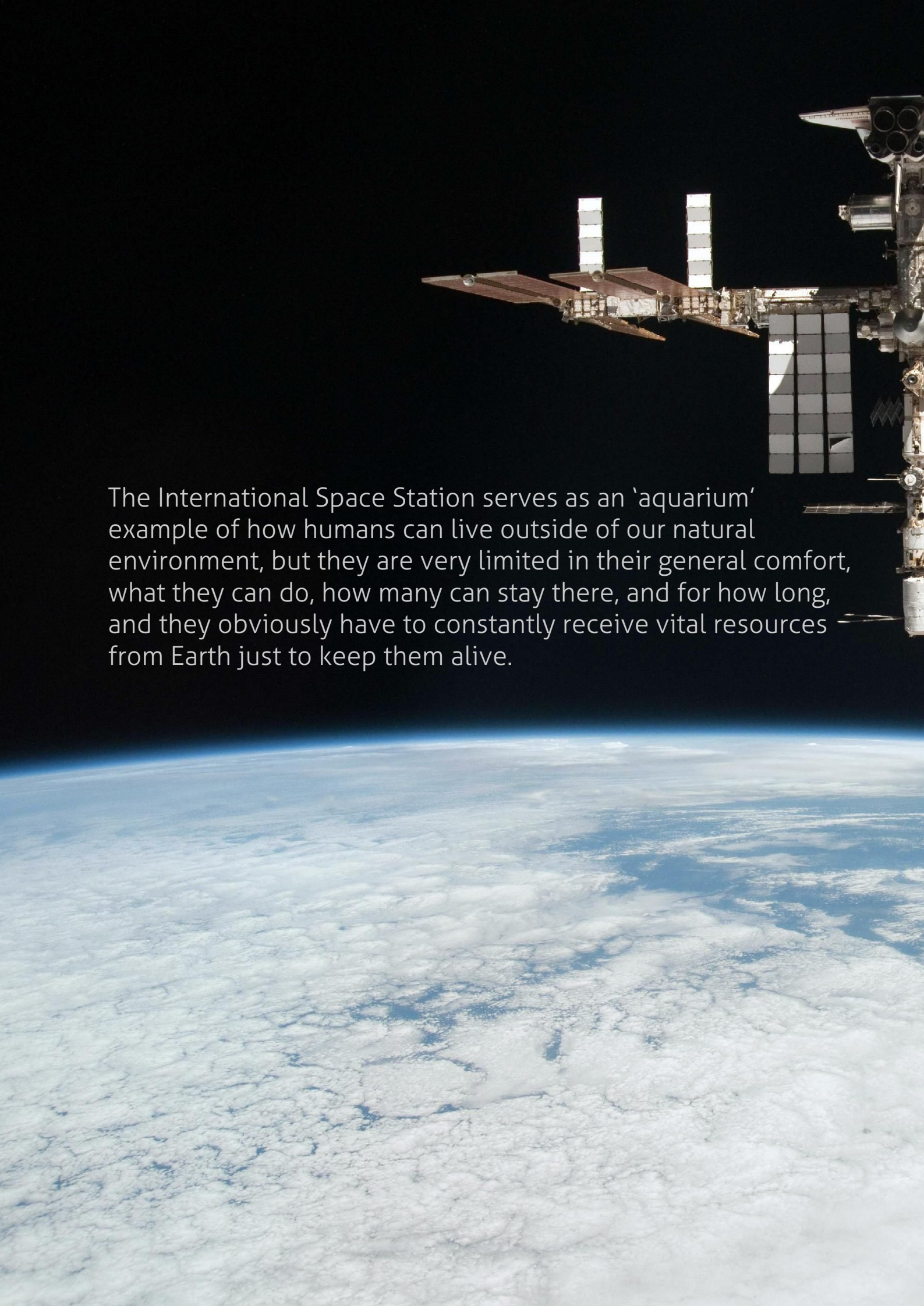
Now let's think of us human beings...

If we go out into space, outside of our atmosphere, we will only last for about 90 seconds. Remember that 'car' that pressures down on your head and shoulders? Well, there is none out in space and, because of this lack of pressure, our body fluids will boil, transforming from liquids to gas.

We can't breath, either, due to the lack of oxygen in space. Overall, our internal organs will expand and we will start to look nothing like a human being. A 'stiff' dead bunch of frozen cells in space.(source)

For us to go into space, as in the case of the fish, we need to take our environment with us. From the lack of elements that we need to survive, to the high concentration of cosmic rays that are deadly to us and no longer being shielded by Earth's atmosphere, and the very low temperatures in space, just to name a few, we humans do not belong there, just as the fish doesn't belong on land.

Who knows how we might learn to manipulate our biology in the future, but for now, we are still Earth-bound creatures.



The International Space Station serves as an 'aquarium' example of how humans can live outside of our natural environment, but they are very limited in their general comfort, what they can do, how many can stay there, and for how long, and they obviously have to constantly receive vital resources from Earth just to keep them alive.

Luckily for us, we can walk around on Earth without hardly any protection. We may need some clothes where is too cold for our tolerances, some slippers where is too sharp to walk, some sun protection where it's too sunny or too hot, and some 'medicine' where there is a risk of a disease. Generally speaking, we can walk around on this planet without a problem, but we don't seem to appreciate that enough.

It's also true that there are many places 'on' this planet where we have to bring 'our' environment with us again: we need a water-tight submersible or scuba diving gear to go into the fish's world, oxygen and mountain/snow gear if we choose to climb tall mountains or visit the Earth's poles or certain caves, and other equipment when we explore environments that are 'extreme' for our physiology. Those places tend to be rare for our needs.

However, we should keep in mind that if we were to not use 'technology' at all, our lives would look nothing like today. However naturally suited this world is for us, without proper technology and systems to combat diseases or predators, or to provide billions of us with food, potable water and care for our basic needs, it would be a huge challenge for our species to survive, as it was for our more ancient ancestors. The balance between this suited 'home' and the modern lifestyle we need to progress as a species, must be carefully understood and managed.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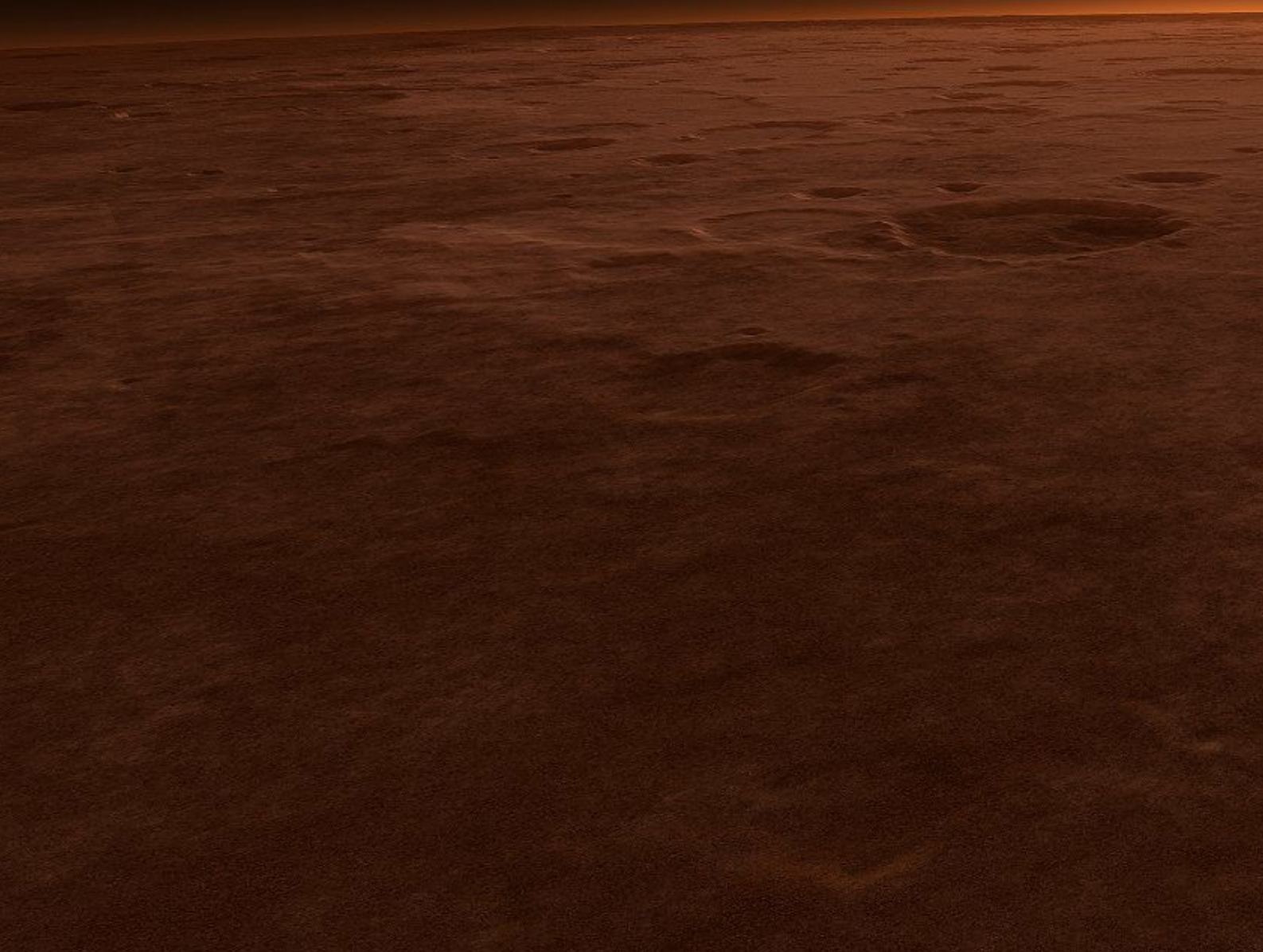
Going back to how lucky we are to be inhabiting this sphere, we must understand that there is no other planet in our solar system where we can settle and continue to develop as we can here - nowhere near it. Mars lacks the air pressure needed to hold water on its surface; it has no magnetic field, so it cannot protect us from solar wind radiation; it lacks most of the resources we have on Earth; not to mention the long and dangerous trip there.

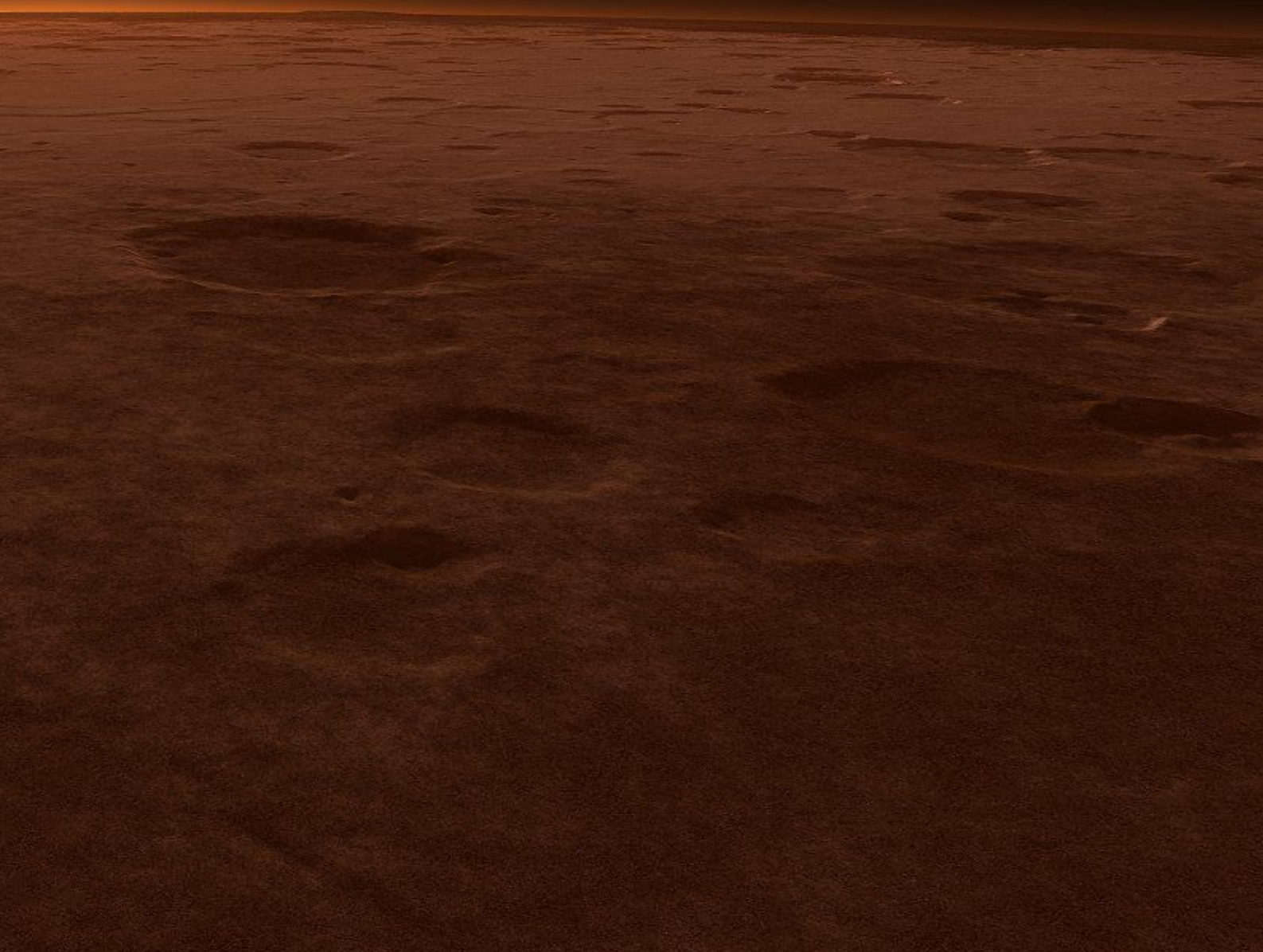
How would we move billions of people to Mars, plus everything else that we would require in order to even have a chance to recover there? Maybe Mars will become a second 'home' in the distant future, but it pales in comparison to the possibilities that Earth offers us: from the complexity of life, the atmosphere and the magnetic shield, to the many landscapes from which we still have so much to learn from, or the richness of resources that exist here.



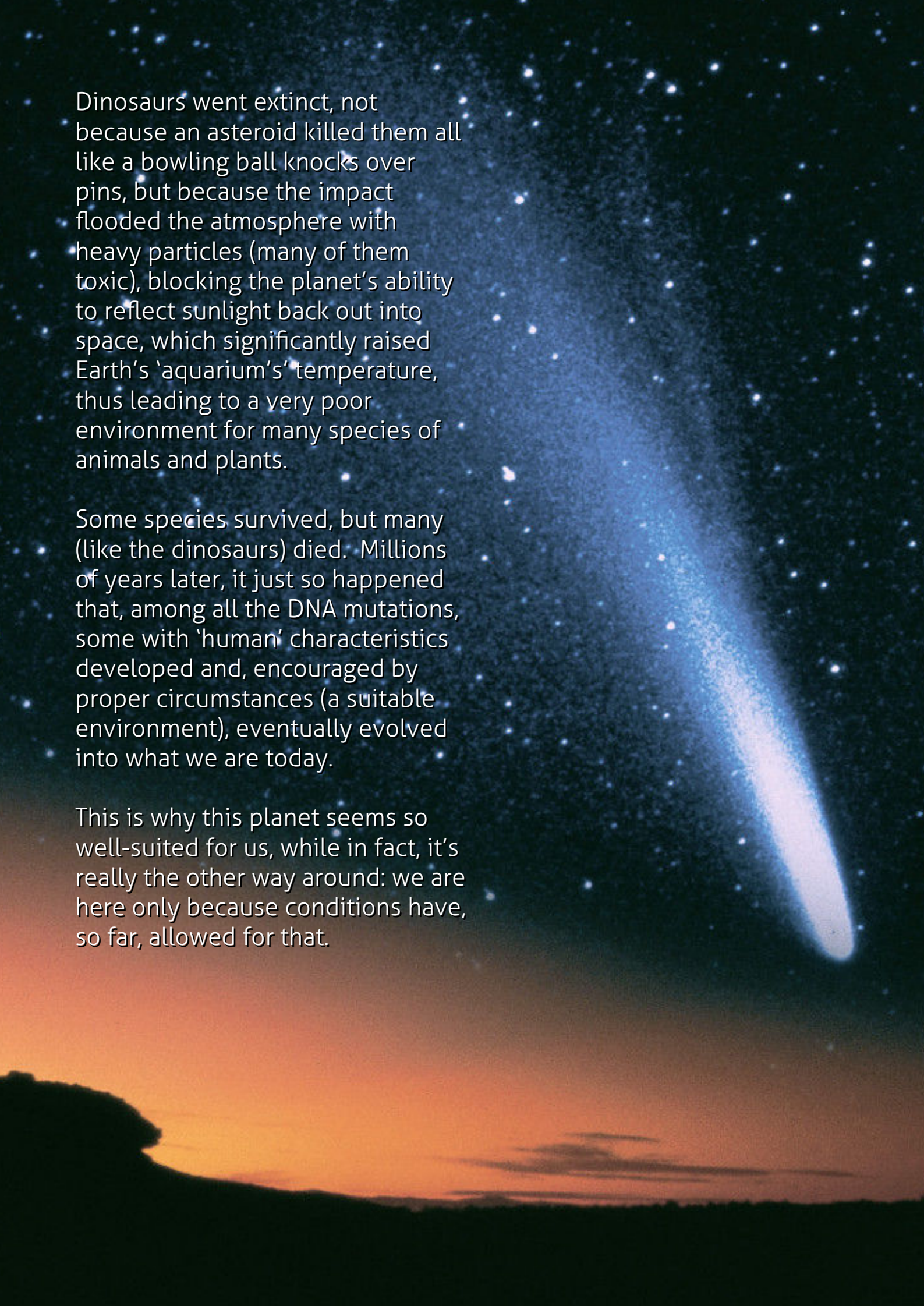
Living on Mars is like living in the desert, but with a 'high' temperature of -10 degrees Fahrenheit (-23 degrees Celsius) during the day, nearly trapped inside specially designed buildings that, you can only hope with all of your knowledge, will protect you from all deadly cosmic rays and provide you with enough of the necessities of life to survive.

Of course, if you want go outside, you'll have to wear a special, quite bulky suit. Well, that's Mars.(source)

The other planets are not only much further away, but are completely uninhabitable for humans: from planets full of volcanoes and temperatures of hundreds of degrees, to extreme pressures and gravitational forces, or storms with winds of thousands of miles per hour. Now think of Earth again.



But Earth wasn't always like it is now. It was a world of volcanoes at one point, bombarded by asteroids at another, nearly frozen for several periods, and so on. 99% of all species that have ever existed here are extinct.



Dinosaurs went extinct, not because an asteroid killed them all like a bowling ball knocks over pins, but because the impact flooded the atmosphere with heavy particles (many of them toxic), blocking the planet's ability to reflect sunlight back out into space, which significantly raised Earth's 'aquarium's' temperature, thus leading to a very poor environment for many species of animals and plants.

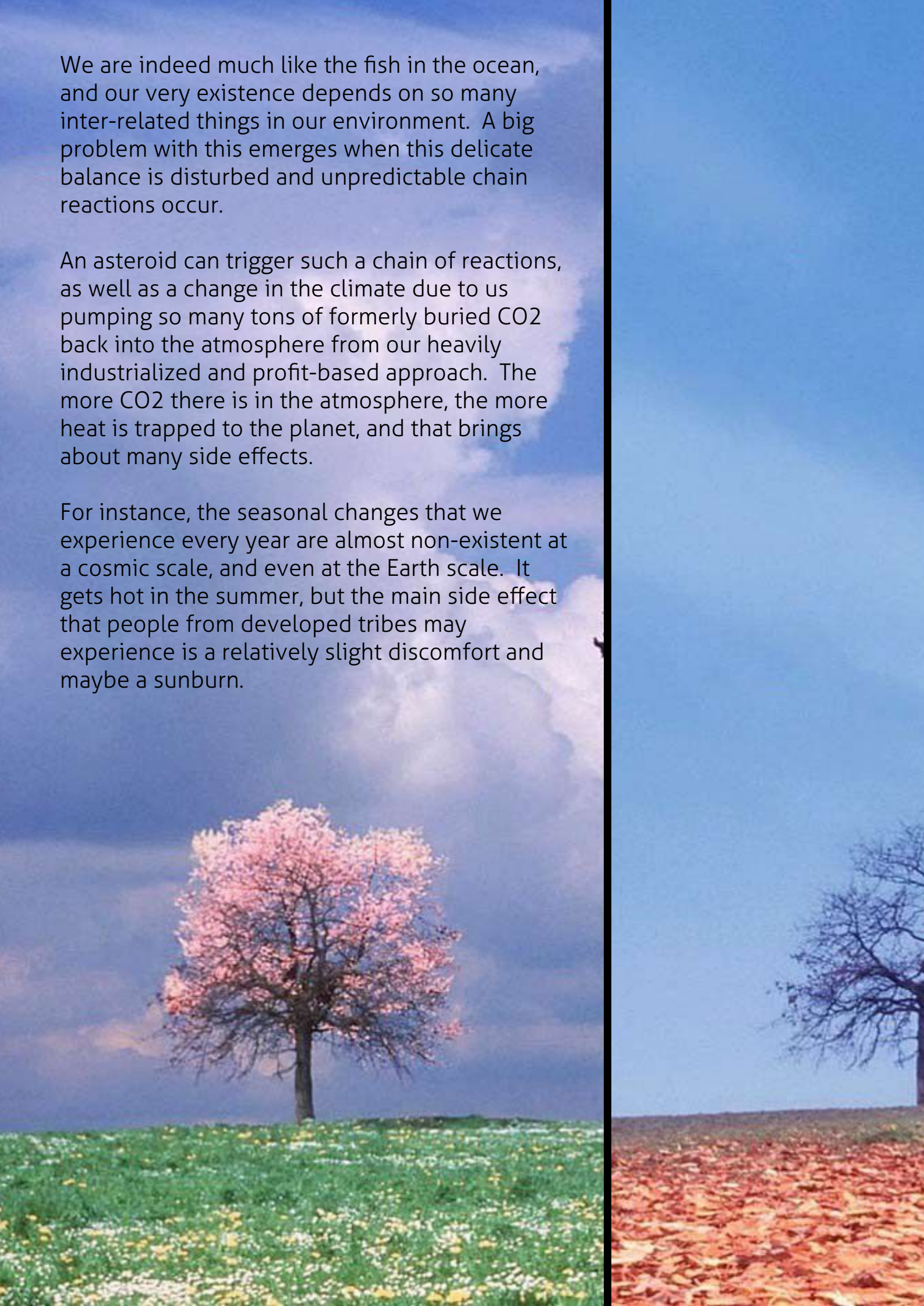
Some species survived, but many (like the dinosaurs) died. Millions of years later, it just so happened that, among all the DNA mutations, some with 'human' characteristics developed and, encouraged by proper circumstances (a suitable environment), eventually evolved into what we are today.

This is why this planet seems so well-suited for us, while in fact, it's really the other way around: we are here only because conditions have, so far, allowed for that.

We are indeed much like the fish in the ocean, and our very existence depends on so many inter-related things in our environment. A big problem with this emerges when this delicate balance is disturbed and unpredictable chain reactions occur.

An asteroid can trigger such a chain of reactions, as well as a change in the climate due to us pumping so many tons of formerly buried CO2 back into the atmosphere from our heavily industrialized and profit-based approach. The more CO2 there is in the atmosphere, the more heat is trapped to the planet, and that brings about many side effects.

For instance, the seasonal changes that we experience every year are almost non-existent at a cosmic scale, and even at the Earth scale. It gets hot in the summer, but the main side effect that people from developed tribes may experience is a relatively slight discomfort and maybe a sunburn.

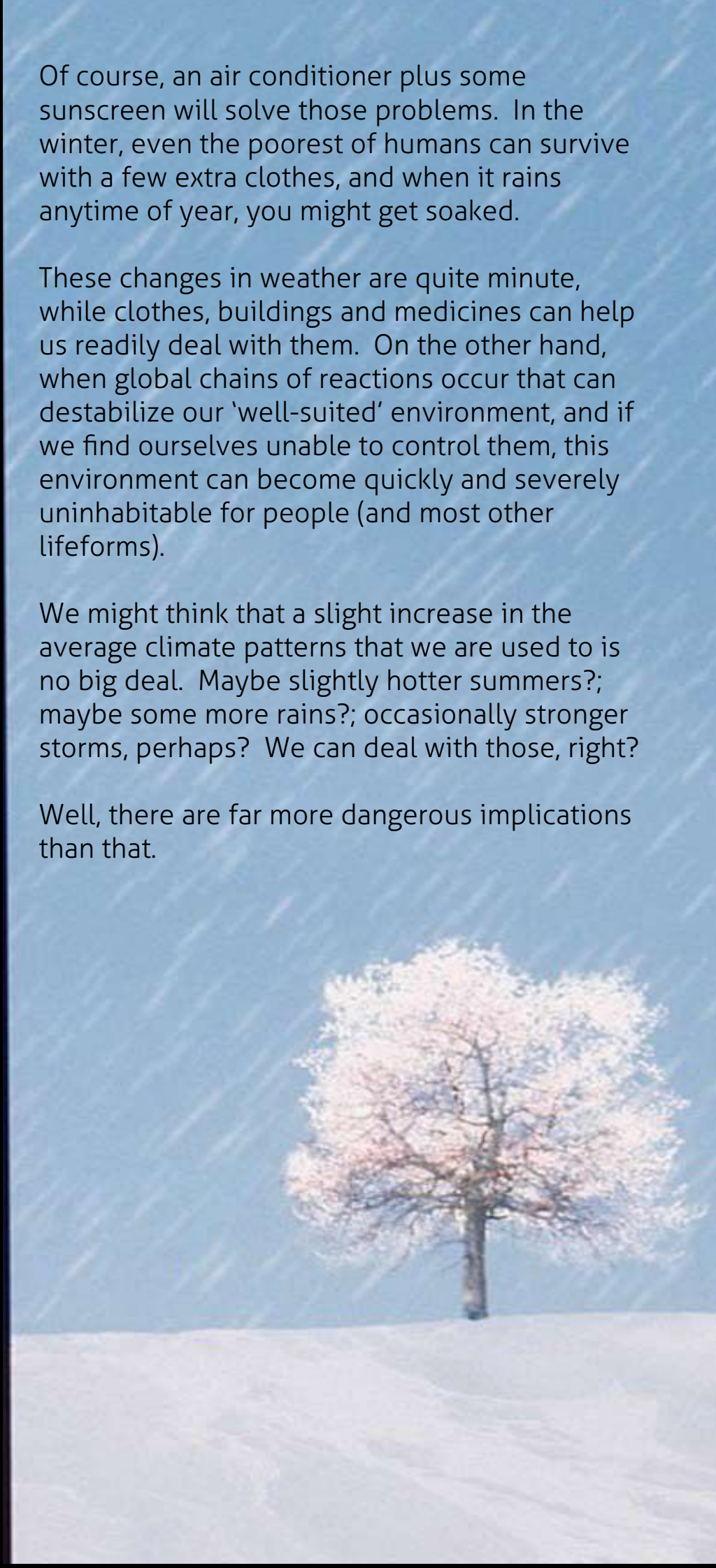


Of course, an air conditioner plus some sunscreen will solve those problems. In the winter, even the poorest of humans can survive with a few extra clothes, and when it rains anytime of year, you might get soaked.

These changes in weather are quite minute, while clothes, buildings and medicines can help us readily deal with them. On the other hand, when global chains of reactions occur that can destabilize our 'well-suited' environment, and if we find ourselves unable to control them, this environment can become quickly and severely uninhabitable for people (and most other lifeforms).

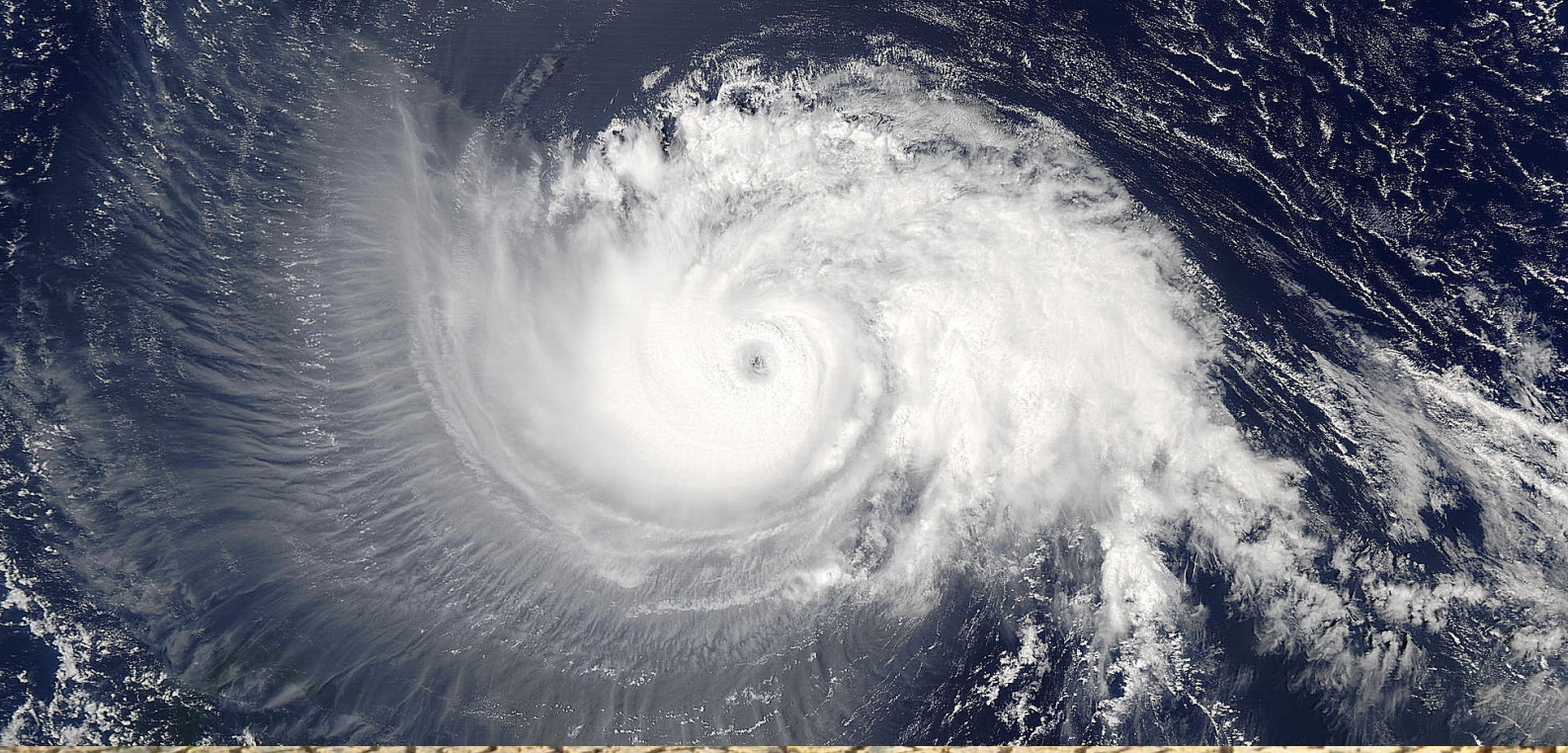
We might think that a slight increase in the average climate patterns that we are used to is no big deal. Maybe slightly hotter summers?; maybe some more rains?; occasionally stronger storms, perhaps? We can deal with those, right?

Well, there are far more dangerous implications than that.



A tiny change, like a global rising temperature of about 4.7 to 8.6 °F (2.6 to 4.8 °C), which is predicted to happen in the lifetime of many of us, if we continue to live as we do today, is expected to trigger massive changes that us humans may not be able to reverse, such as: significant rising of sea level, heating of the oceans beyond what most ocean life can endure, severe scarcity of freshwater, massive droughts, stronger storms affecting agriculture & overall human life and, most importantly, these changes will affect the entire ecosystem (the full 'aquarium' environment) in ways that spread like wildfire.

We may not directly feel it very much at first, but as entire populations of organisms on this planet start to diminish, or even disappear, it may not be reversible before we join them.



Take phytoplankton. These are tiny creatures. Many of them cannot be seen with the naked eye, but there are so many that when they are clustered together, they can be seen from space. These tiny creatures consume carbon dioxide (CO2) on a scale equivalent to forests and other land plants.(source)

Even a slight drop in their growth, which is predicted due to the effects of climate change on the ocean environment, will have a big impact on the climate, since CO2 is one of the main gases that trap heat to the planet, which then leads this climate change in the first place. This effect is called a positive feedback loop.

The drop in phytoplankton population, and thus their lessened ability to absorb as much CO2, will then accelerate climate change, which will then lower their population even more, along with their ability to absorb CO2.

It's not only the effect on atmospheric CO2 levels that the tragic death of these tiny creatures will negatively affect. Phytoplankton is also the main source of food for many of the ocean's other creatures.

Large populations of fish in the ocean can perish if the phytoplankton population diminishes too far, and human populations can diminish if those fish perish, as many of them provide an important source of human food.

If you didn't before, perhaps now you're beginning to realize the immense scale of chain reactions that can occur by only warming the global climate by a few degrees, and this example is just one of the billions of such changes that can occur due to a single factor such as climate change.

Volcanic eruptions and strong solar storms can also equate to destabilization of Earth's environment.

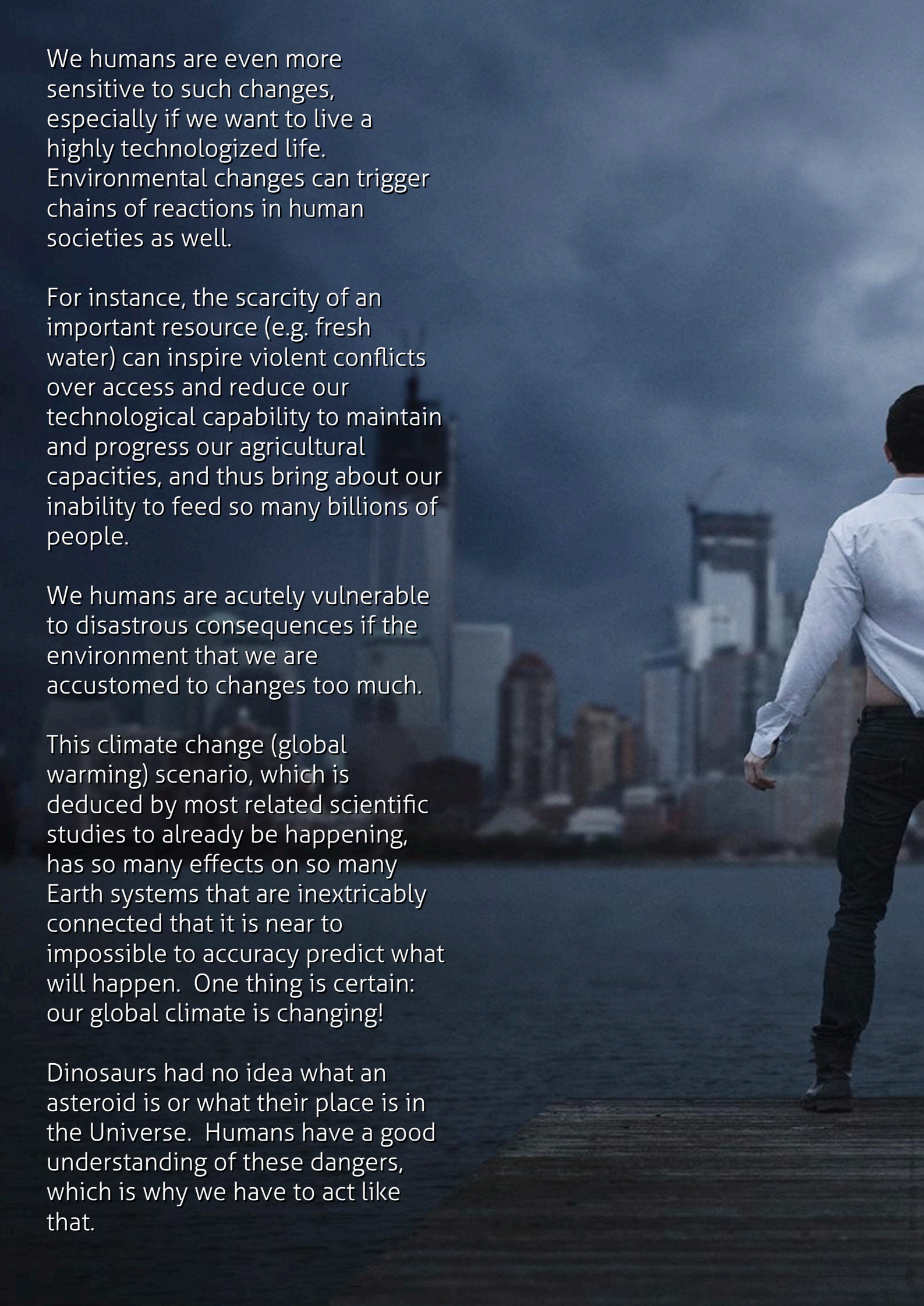
We humans are even more sensitive to such changes, especially if we want to live a highly technologized life. Environmental changes can trigger chains of reactions in human societies as well.

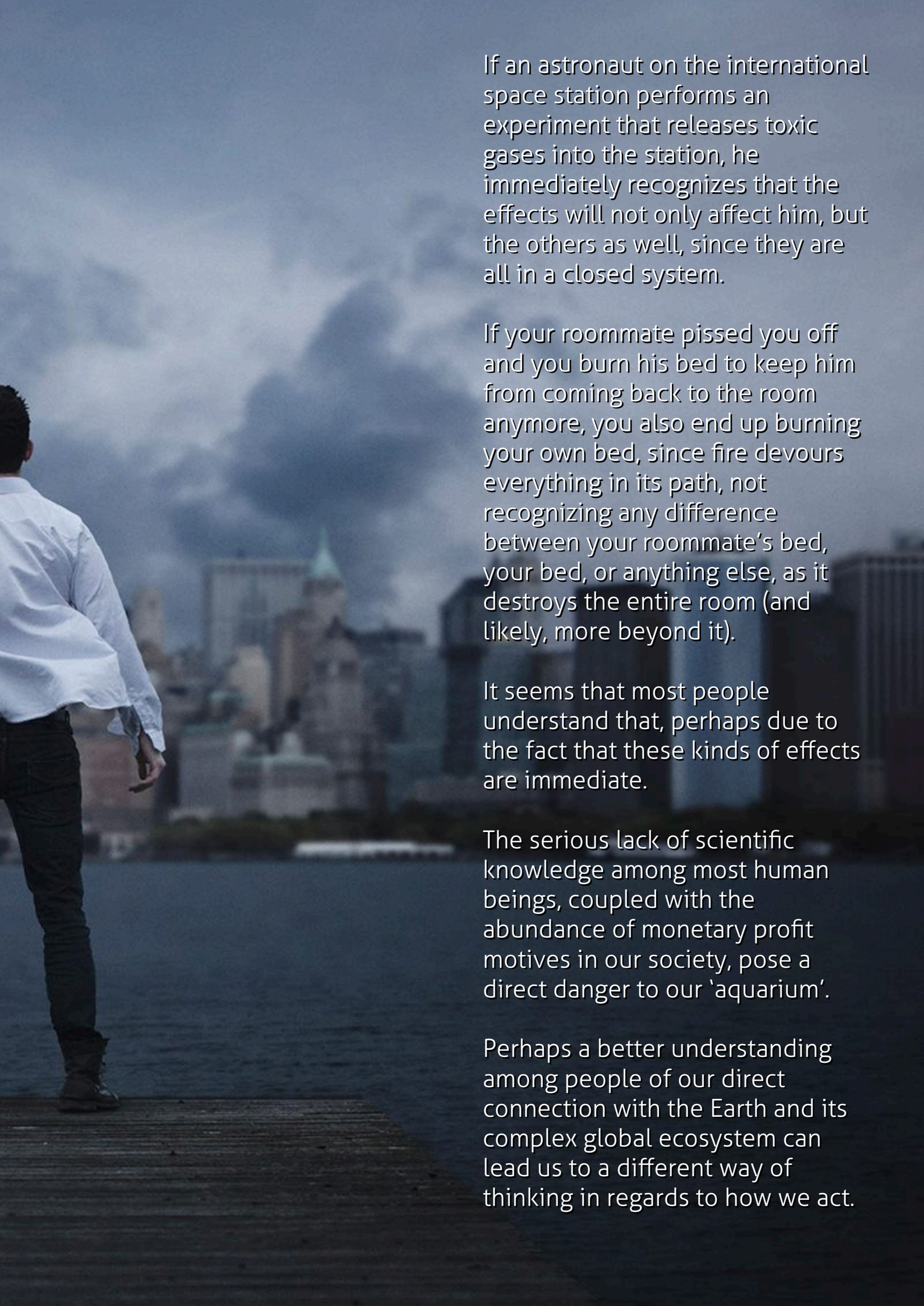
For instance, the scarcity of an important resource (e.g. fresh water) can inspire violent conflicts over access and reduce our technological capability to maintain and progress our agricultural capacities, and thus bring about our inability to feed so many billions of people.

We humans are acutely vulnerable to disastrous consequences if the environment that we are accustomed to changes too much.

This climate change (global warming) scenario, which is deduced by most related scientific studies to already be happening, has so many effects on so many Earth systems that are inextricably connected that it is near to impossible to accuracy predict what will happen. One thing is certain: our global climate is changing!

Dinosaurs had no idea what an asteroid is or what their place is in the Universe. Humans have a good understanding of these dangers, which is why we have to act like that.





If an astronaut on the international space station performs an experiment that releases toxic gases into the station, he immediately recognizes that the effects will not only affect him, but the others as well, since they are all in a closed system.

If your roommate pissed you off and you burn his bed to keep him from coming back to the room anymore, you also end up burning your own bed, since fire devours everything in its path, not recognizing any difference between your roommate's bed, your bed, or anything else, as it destroys the entire room (and likely, more beyond it).

It seems that most people understand that, perhaps due to the fact that these kinds of effects are immediate.

The serious lack of scientific knowledge among most human beings, coupled with the abundance of monetary profit motives in our society, pose a direct danger to our 'aquarium'.

Perhaps a better understanding among people of our direct connection with the Earth and its complex global ecosystem can lead us to a different way of thinking in regards to how we act.

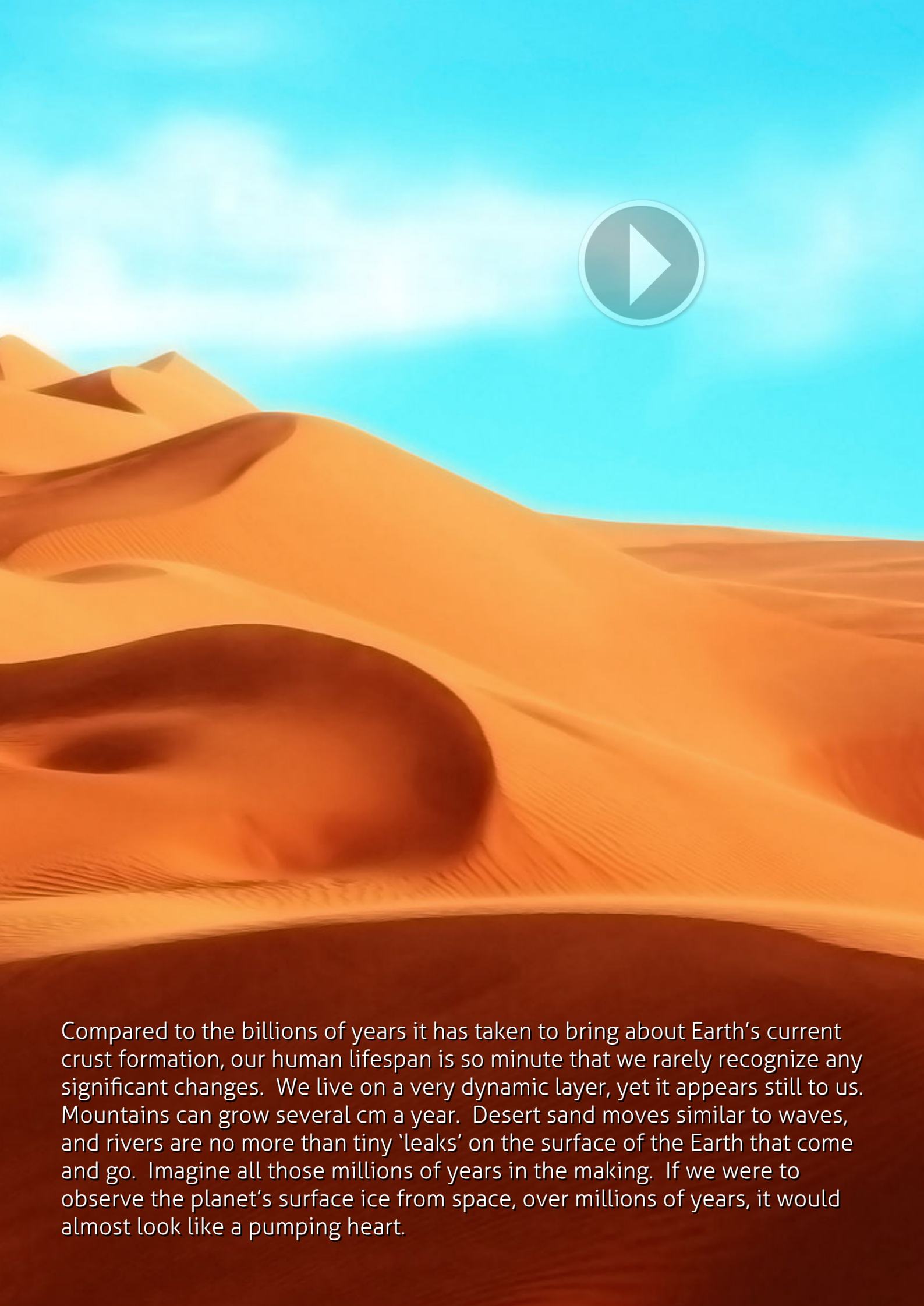
There are many poetries and sentimental ideas/movements that describe our connection with the Earth. But science, as we have briefly shown, is far more powerful and no doubt much more important in showing us that connection.

We cannot forget that this is 'our' stewardship of the world that we're talking about here. Planet Earth has existed for some 4.5 billion years. We, for only a tiny fraction of that. Our existence, and the environment that allows for our existence, is like a single frame in a years-long movie. Therefore, if we want to survive (and thrive), our goal must be to maintain this state of environment for as many of those frames as possible. There is no "let's save planet Earth", because the planet needs no saving. We do!

I hope you understand now why Earth is our home: because for one there is no better planet to go to, and second, from the atmosphere to resources, organisms and climate, this sphere is a marvel of complexity and opportunity for us humans and all other living things.

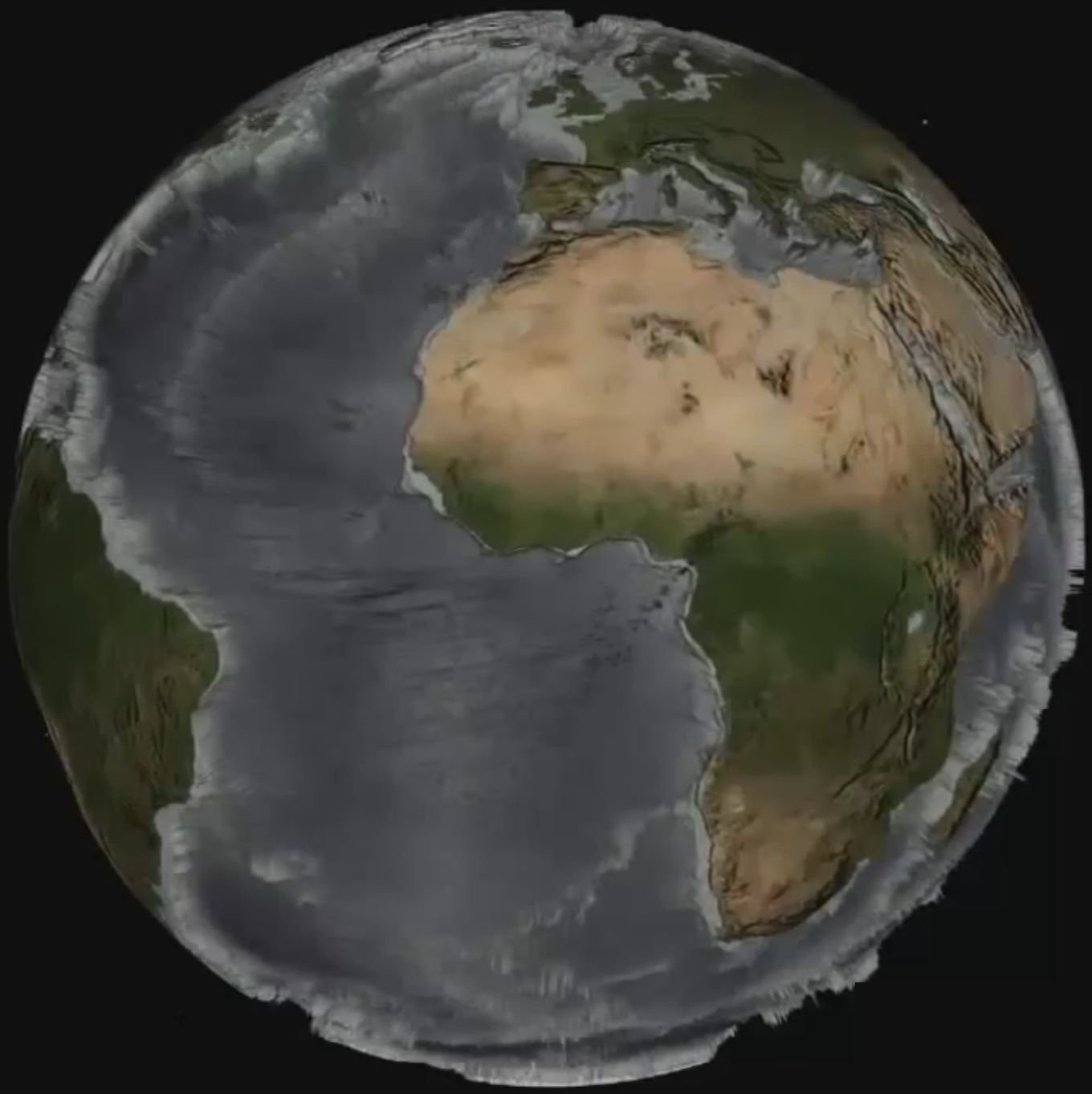
PLACES

Every day your skin changes. You lose between 30,000 to 40,000 skin cells a day. Your skin gets renewed constantly. The same principle applies to the entire surface of the planet. Mountains, valleys, caves, and other geological features are basically cooled lava, which is a mixture of various elements that creates the 'skin' of Earth, which we refer to as its crust. When large chunks of this crust collide, driven by the molten lava beneath, it creates tall (for us) bulges of matter that we call mountains.



Compared to the billions of years it has taken to bring about Earth's current crust formation, our human lifespan is so minute that we rarely recognize any significant changes. We live on a very dynamic layer, yet it appears still to us. Mountains can grow several cm a year. Desert sand moves similar to waves, and rivers are no more than tiny 'leaks' on the surface of the Earth that come and go. Imagine all those millions of years in the making. If we were to observe the planet's surface ice from space, over millions of years, it would almost look like a pumping heart.

To better grasp the structures on Earth's skin-surface, we have to get it water-naked. If we could temporarily remove all the water from the planet, this is what Earth would look like (exagerrated to enhance the features):



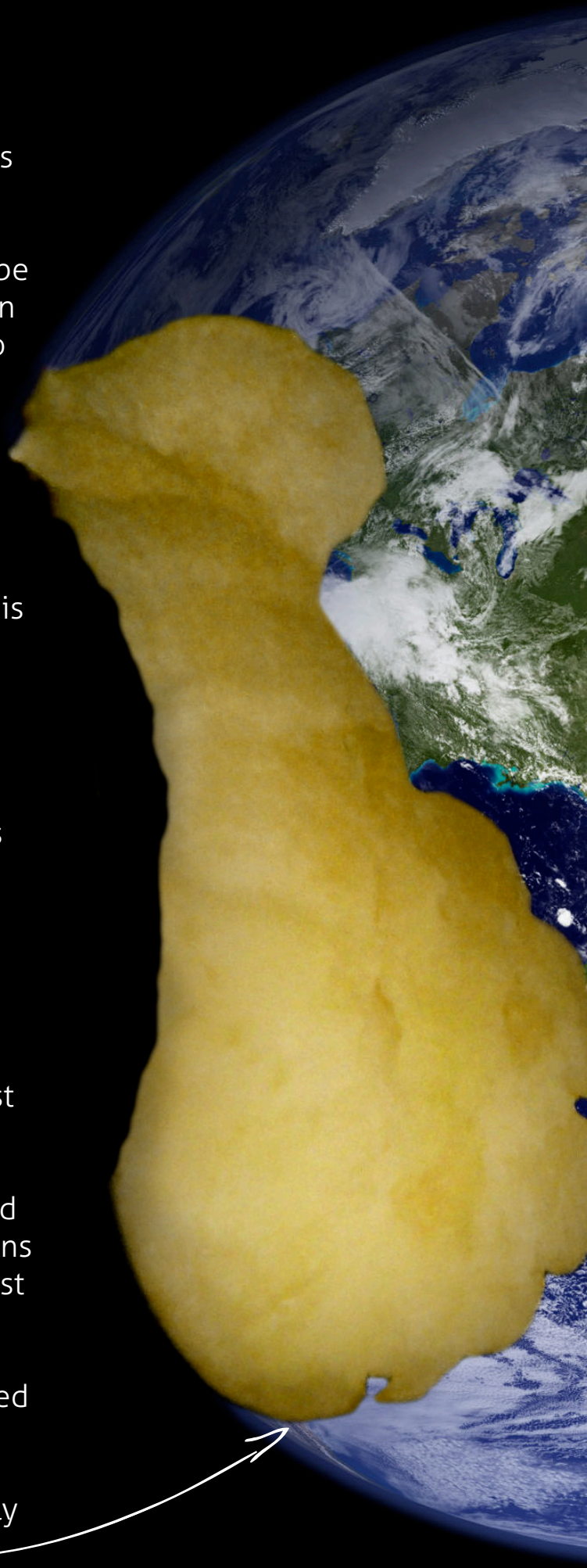
Mountains and valleys, caves and rivers, now seem quite different, and are able to provide a different context from how we normally view them.

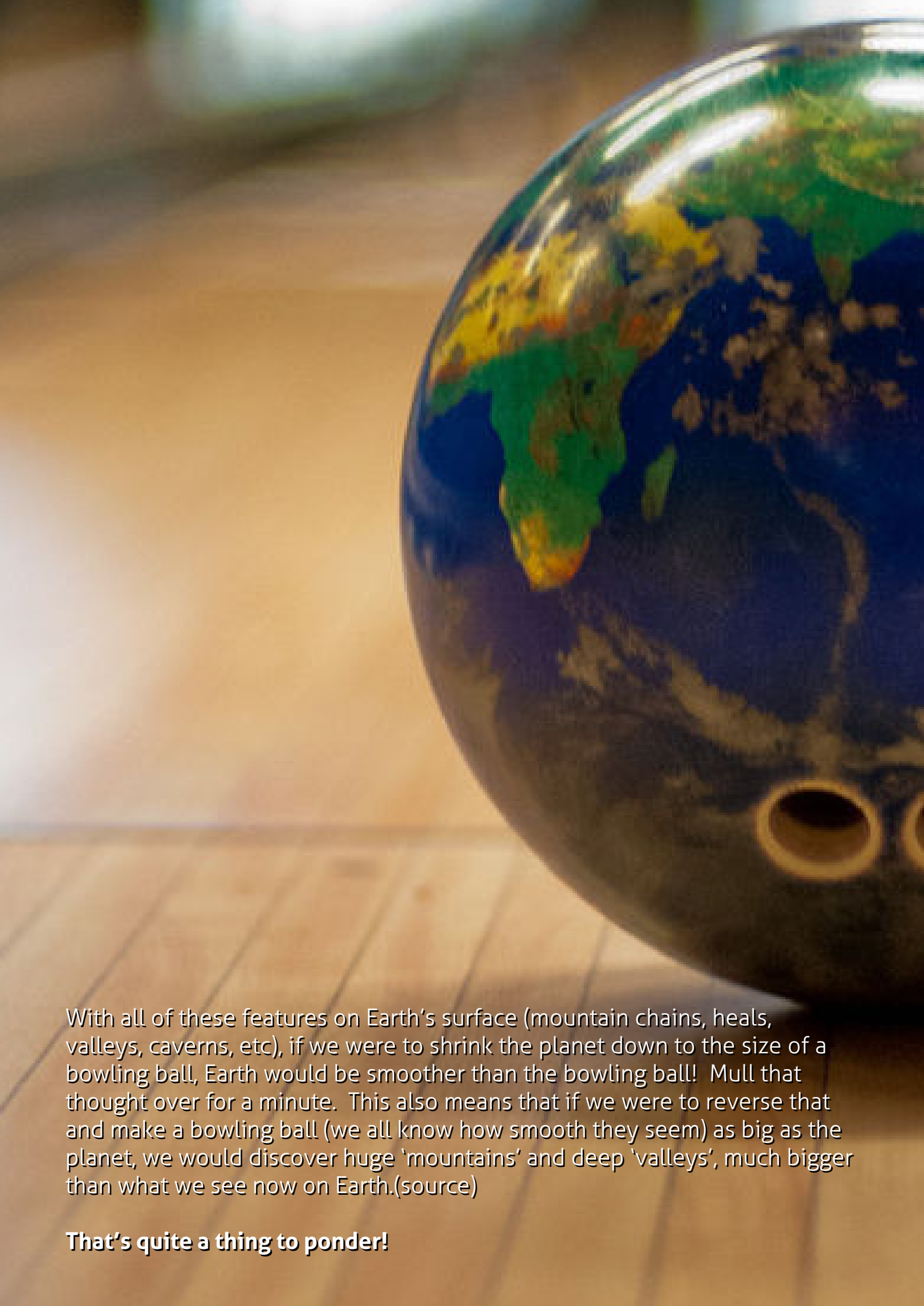
All of these tall mountains, deep oceans and caves, all of the creatures, winds, rains, all of the vast rivers and endless deserts, all of them are on and within this 'skin', a layer that is no thicker than 50 miles (80 km). If Earth was an apple, the entire world we know and live in would be the apple's skin. The rest is either molten lava, or deep freezing space. It is hard to comprehend that beneath our feet is a very thin sheet of rock that protects us from a gigantic molten and radioactive core.

Now, to make it even more exact, if we were to calculate the highest point on this crust and the lowest one, this is even thinner.

The best way to figure out what is the highest and lowest point on Earth, is to relate it to the Earth's core. You see, this planet is not a perfect sphere, its 'belt' is more bulgy (the equator), thus if it was complete flat on its surface, without any mountains and holes, the 'belt' region of the Earth would be the highest one.

That being said, the famed Mount Everest is not the highest point on the planet, as many would think. The highest point is actually a peak on the biggest land-based mountain chain, the Andes, which happens to reside on the planet's 'belt'. The lowest point is somewhere at the bottom of the Arctic Ocean, much closer to one of the planet's poles. These points are measured relative to the Earth's core. Thus, the difference between lowest to highest points on the surface of the planet is only around 8.6 miles (14 km).(source)



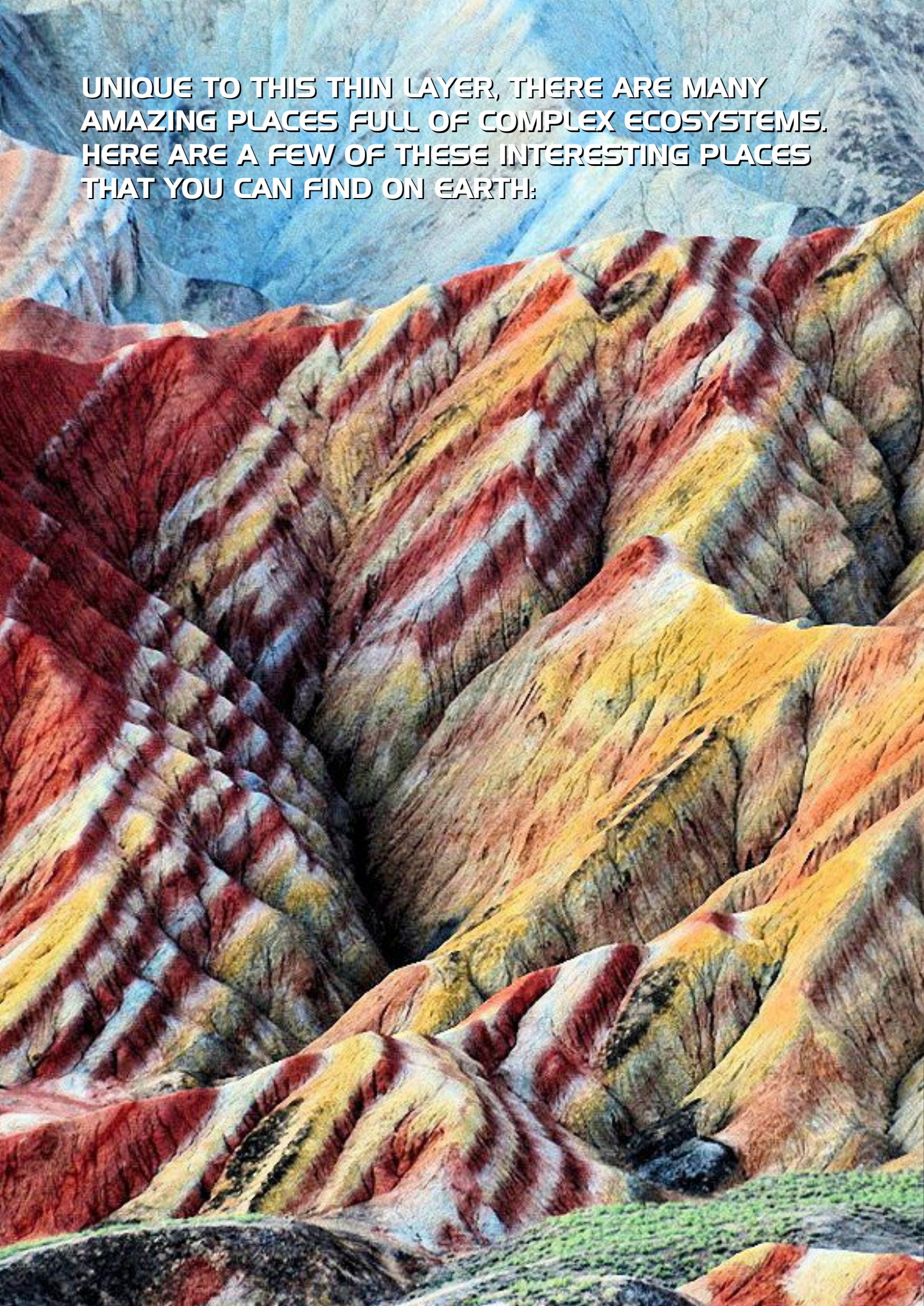


With all of these features on Earth's surface (mountain chains, heals, valleys, caverns, etc), if we were to shrink the planet down to the size of a bowling ball, Earth would be smoother than the bowling ball! Mull that thought over for a minute. This also means that if we were to reverse that and make a bowling ball (we all know how smooth they seem) as big as the planet, we would discover huge 'mountains' and deep 'valleys', much bigger than what we see now on Earth.(source)

That's quite a thing to ponder!

So, Earth's crust is no thicker than an apple's skin compared to an apple, the crust's features (mountains and holes) are smoother than a bowling ball's surface if we shrink Earth to that size, and everything we're aware of (the grand canyon, the vast oceans, lions and zebras, insects and fish, clouds and storms, caves and rivers) is part of a meager 8.6 mile (14 km) layer.

That should put some things in perspective.

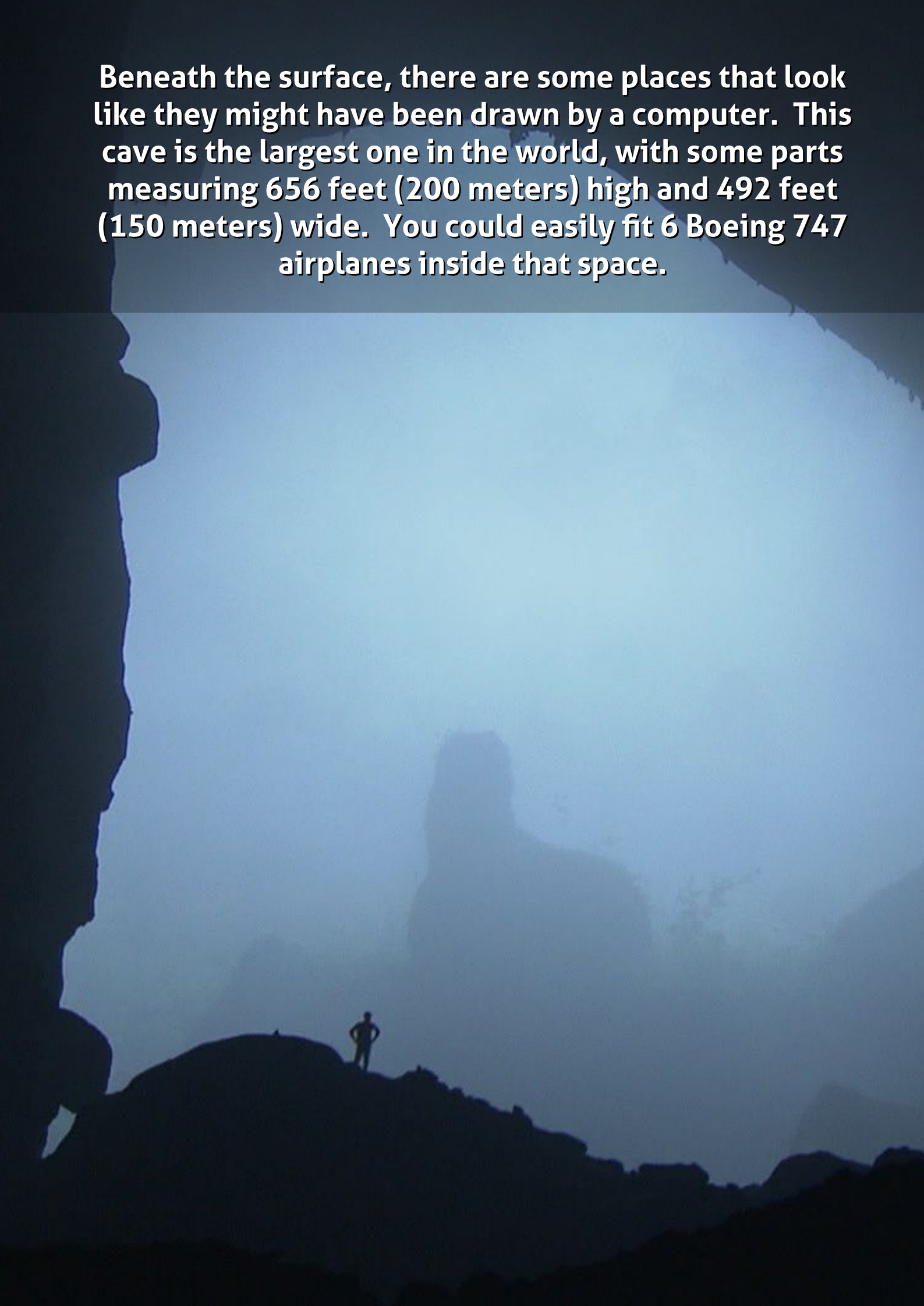


UNIQUE TO THIS THIN LAYER, THERE ARE MANY AMAZING PLACES FULL OF COMPLEX ECOSYSTEMS. HERE ARE A FEW OF THESE INTERESTING PLACES THAT YOU CAN FIND ON EARTH:

Looking similar to cakes, these mountains are revealing different layers of rock deposited over the course of 24 million years. You can actually 'read time' by looking through the colorful layers.

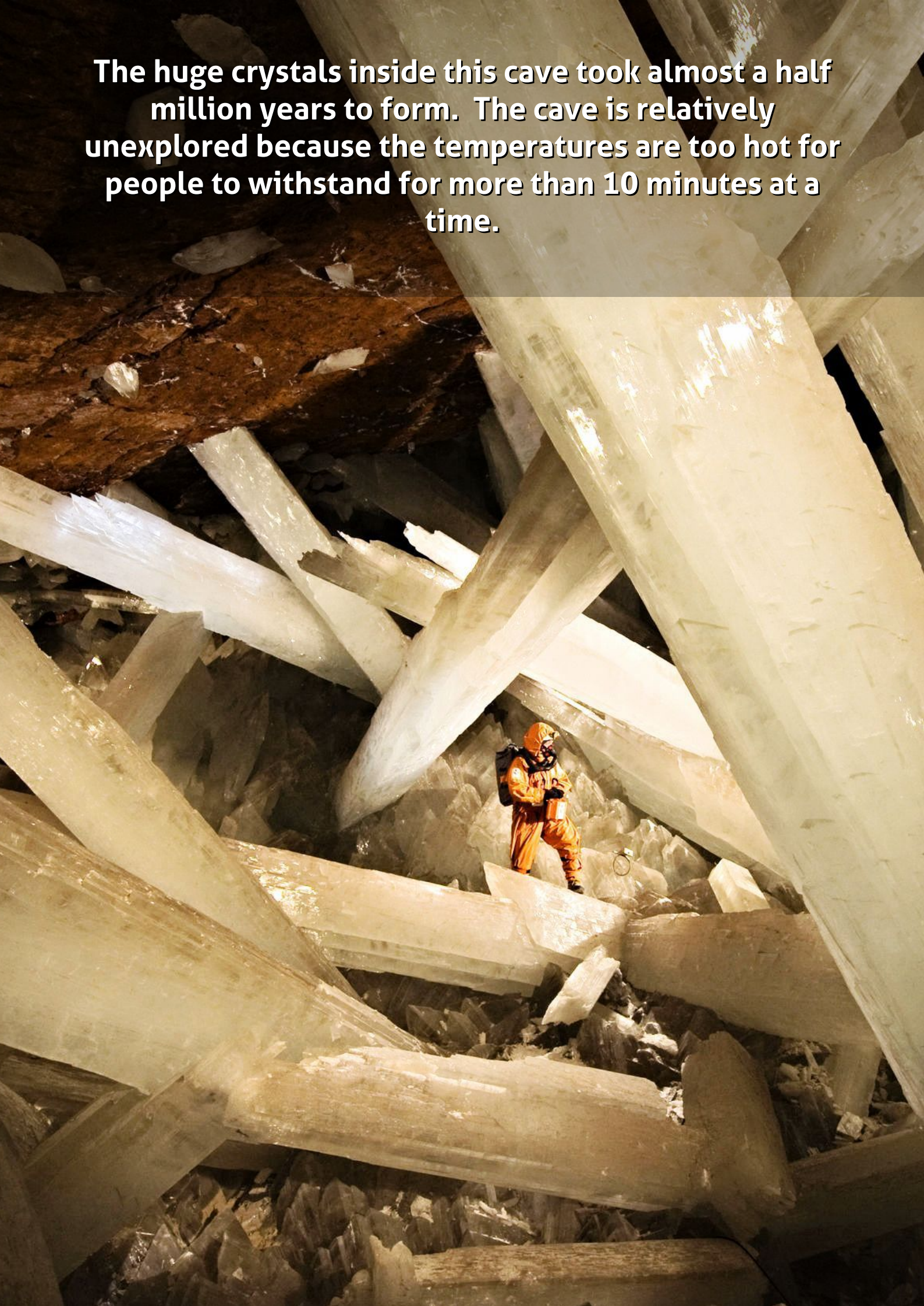

These mountains are considered one of the oldest geological formations on Earth, dating around 2 billion years.

Some places look like they were human-made, like these piles of rocks that show how, given enough time, Earth's crust can come up with amazing sculptures.



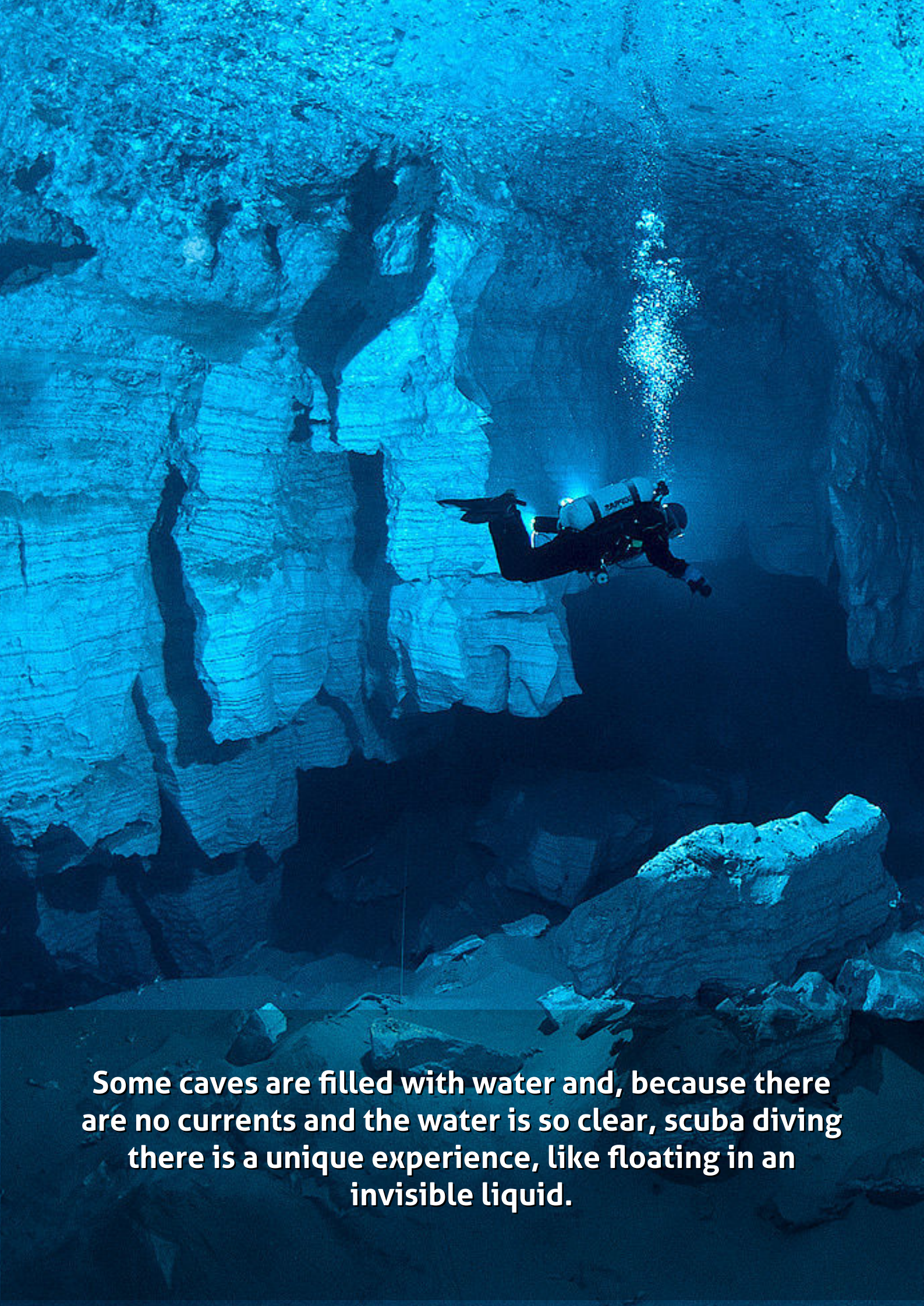
Beneath the surface, there are some places that look like they might have been drawn by a computer. This cave is the largest one in the world, with some parts measuring 656 feet (200 meters) high and 492 feet (150 meters) wide. You could easily fit 6 Boeing 747 airplanes inside that space.

Ice caves are temporary holes created inside big chunks of ice. They are mostly created by lava that once flowed through the ice, leaving a tunnel along its path.



The huge crystals inside this cave took almost a half million years to form. The cave is relatively unexplored because the temperatures are too hot for people to withstand for more than 10 minutes at a time.


This cave is so deep you could easily fit 7 Eiffel
Towers on on top of the other.



Some caves are filled with water and, because there are no currents and the water is so clear, scuba diving there is a unique experience, like floating in an invisible liquid.

These holes can be inside different types of rocks or ice and, when they are underwater or filled with water, their exploration and environment changes a lot. Exploring these holes give us a better understanding of ecosystems that lack sunlight, are exposed to less oxygen or a greater quantity of methane or other gases, lacking in nutrients, or continuous high humidity; overall environments that are very unique and quite challenging to map, analyze or even observe. Because of that, and perhaps due to monetary constraints, only a small fraction of known cave systems are explored.

This is not a huge mirror, it is naturally formed salty water on a plane that is so leveled that it is used by satellites to calibrate their altitude.

These two ‘pools’ are formed by hot water, a mixture of minerals and tiny life forms (bacteria).

This ‘pool’s’ color is also made by tiny organisms. The color is permanent, and does not alter when some of the water is collected in a container.

This forest may look normal, but the trees here are over 370 feet (112 m) in height (not counting roots) and up to 26 feet (7.9 m) in diameter.


Humans look like ants next to them.

Forests can also be made of rock.

Or grow under water.

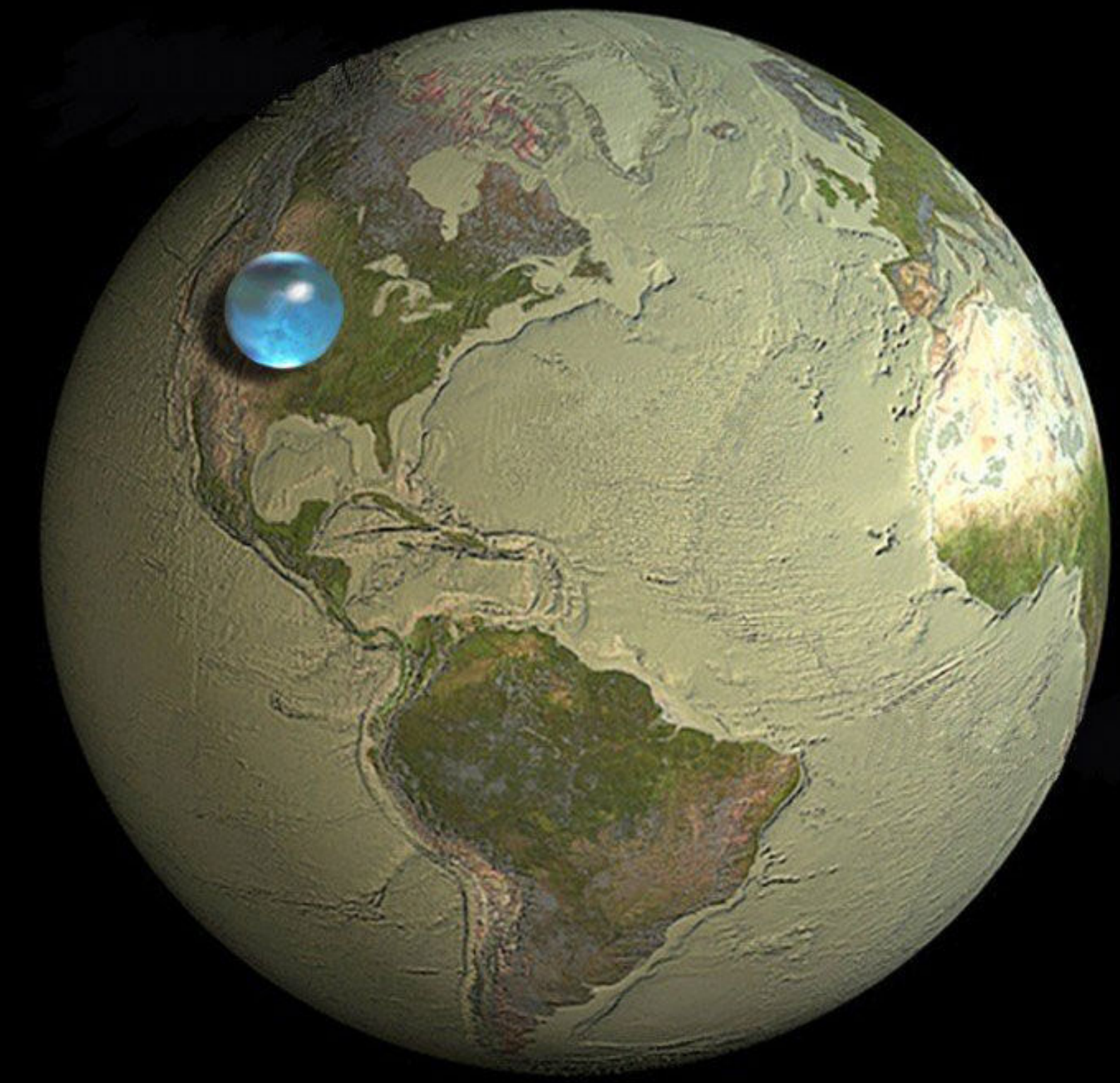
There are also places on Earth that have been long-isolated from the rest, where unique plants and other life forms have evolved.

These ‘strange’ plants are an example of how ‘alien’ such places can become when environmental forces are even a bit different.


Next time you see oceanic islands, think about the fact that the vast majority of them are '3D printed' by volcanoes (molten lava surfacing and cooling).

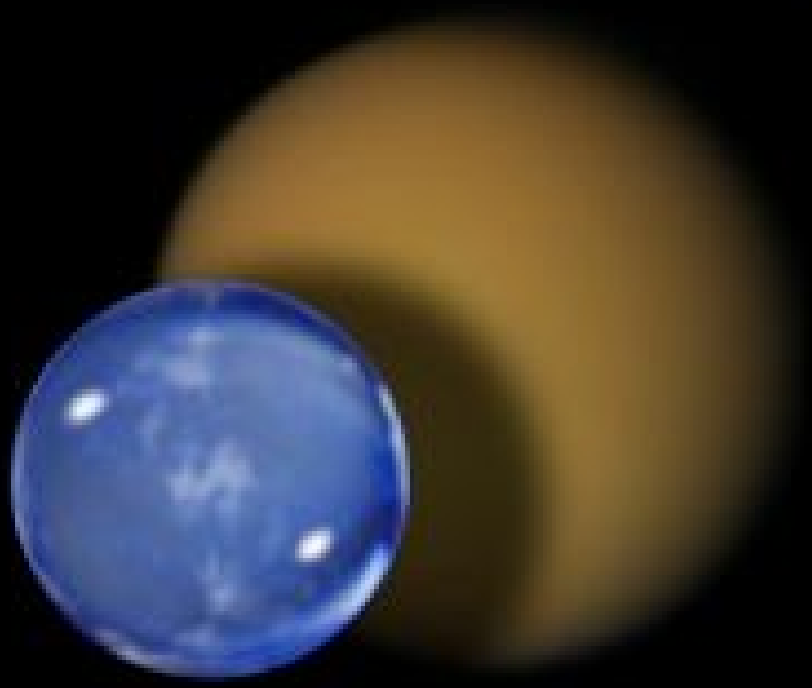
And if one force creates, another one destroys. This is a huge meteor crater, a reminder of the dangers we face from the vastness of space.

Remember the 'naked Earth' description at the beginning of the article? Just how much water did we temporarily remove for that? Well, this much



Although the surface of the Earth is 71% covered in water, if we were to take all of that water, plus all of the water within Earth's crust and in the atmosphere, it would create just a tiny sphere compared to the size of Earth.

Actually, Earth has less water than Titan or Europa (moon sizes are relative to Earth's size) - source



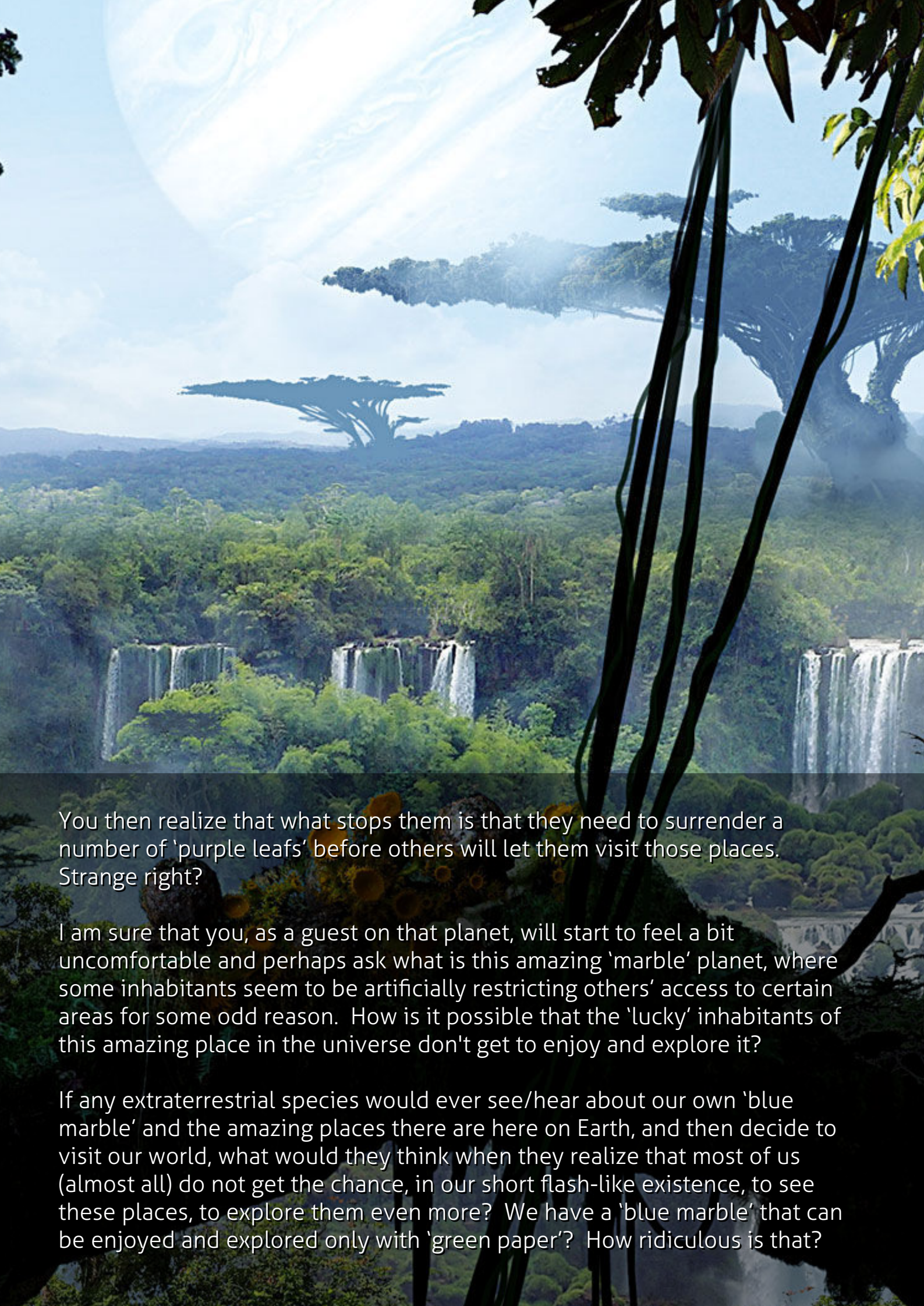
We are very tiny, however, so this relatively small amount of water forms huge oceans back on Earth, so huge that, with all of our technology, we have only explored 5% of it. The remaining 95% is completely unexplored.

All of these places are only a tiny sampling of a highly complex layer of places. All of them conceal secrets that we continuously strive to uncover. These discoveries not only improve our knowledge about ourselves and our place on the planet and in the universe, this collective knowledge also allows us to develop better technologies and methodologies to uplift our societies. Unfortunately, in today's world, very few enjoy all of these amazing places, and even fewer explore them.

I once watched a movie called Avatar (very popular back in 2009) about this 'majestic' planet somewhere far, far away from Earth. The places that the movie makers invented were inspired by real places on planet Earth, but they were far less complex than the real ones.

But there is something else that I want to highlight here: Imagine yourself planning a visit to this 'amazing' planet, where blue people already live, and your curiosity made you learn a bit about their planet before your visit. You were delighted to learn that they have plenty of amazing places on their planet that hide extraordinary complexity but, when you arrive there, you realize that most of the blue people (almost all) have never visited those places.

They live there, and you may have envied them for that 'advantage' before arriving, but now you realize that the fact that they live there provides no significant benefit to them.



You then realize that what stops them is that they need to surrender a number of 'purple leafs' before others will let them visit those places. Strange right?

I am sure that you, as a guest on that planet, will start to feel a bit uncomfortable and perhaps ask what is this amazing 'marble' planet, where some inhabitants seem to be artificially restricting others' access to certain areas for some odd reason. How is it possible that the 'lucky' inhabitants of this amazing place in the universe don't get to enjoy and explore it?

If any extraterrestrial species would ever see/hear about our own 'blue marble' and the amazing places there are here on Earth, and then decide to visit our world, what would they think when they realize that most of us (almost all) do not get the chance, in our short flash-like existence, to see these places, to explore them even more? We have a 'blue marble' that can be enjoyed and explored only with 'green paper'? How ridiculous is that?

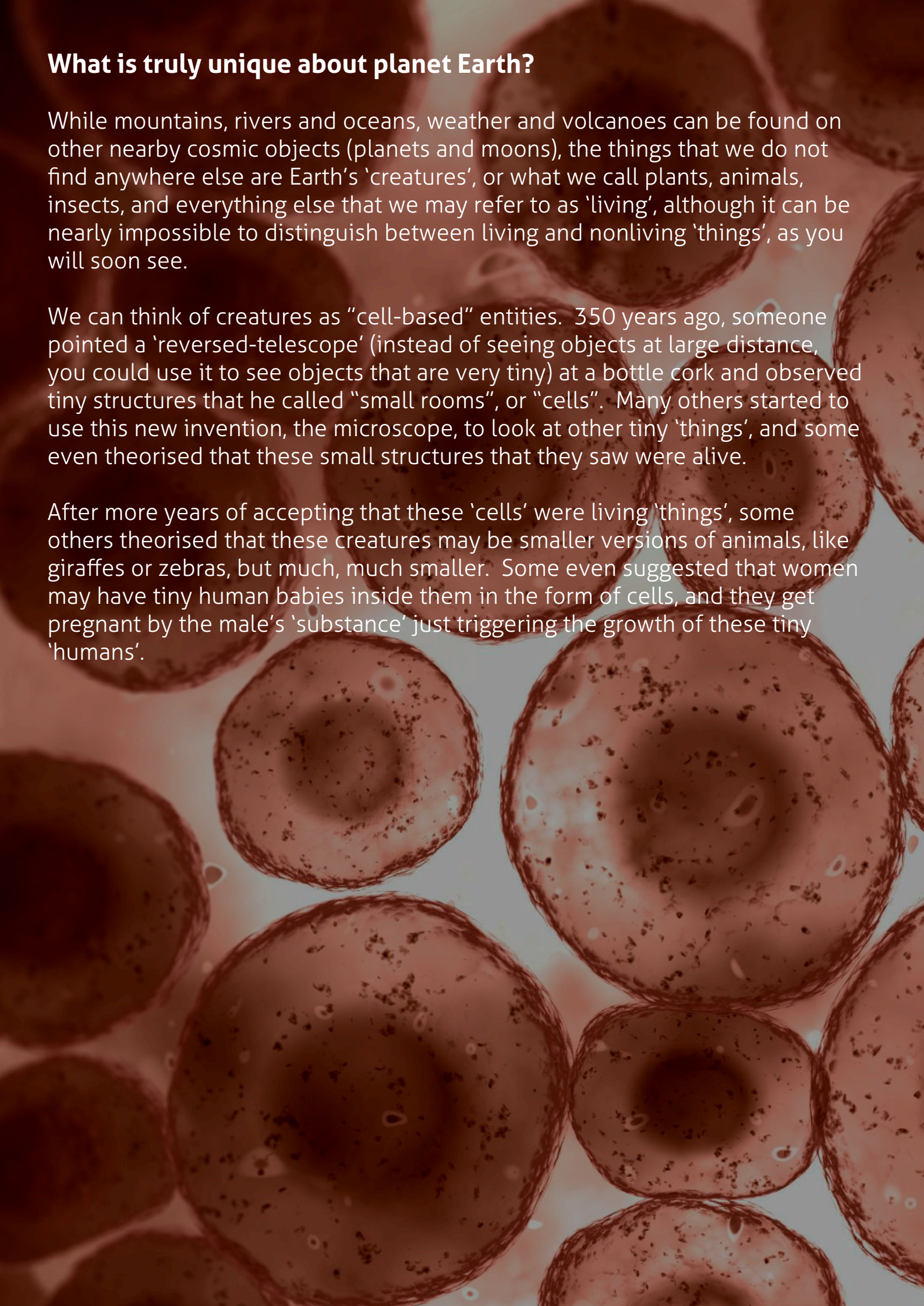
CREATURES

What is truly unique about planet Earth?

While mountains, rivers and oceans, weather and volcanoes can be found on other nearby cosmic objects (planets and moons), the things that we do not find anywhere else are Earth's 'creatures', or what we call plants, animals, insects, and everything else that we may refer to as 'living', although it can be nearly impossible to distinguish between living and nonliving 'things', as you will soon see.

We can think of creatures as "cell-based" entities. 350 years ago, someone pointed a 'reversed-telescope' (instead of seeing objects at large distance, you could use it to see objects that are very tiny) at a bottle cork and observed tiny structures that he called "small rooms", or "cells". Many others started to use this new invention, the microscope, to look at other tiny 'things', and some even theorised that these small structures that they saw were alive.

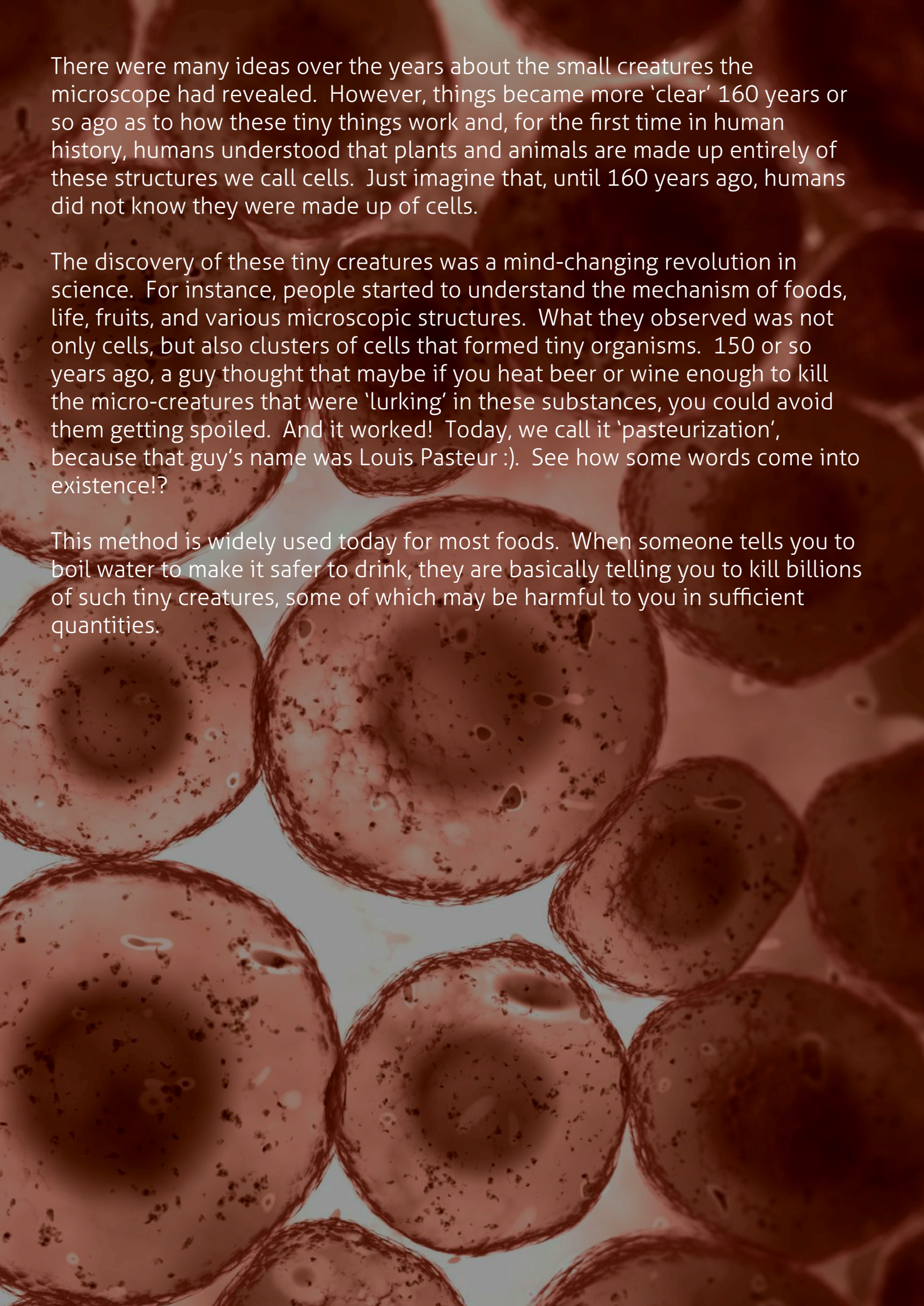
After more years of accepting that these 'cells' were living 'things', some others theorised that these creatures may be smaller versions of animals, like giraffes or zebras, but much, much smaller. Some even suggested that women may have tiny human babies inside them in the form of cells, and they get pregnant by the male's 'substance' just triggering the growth of these tiny 'humans'.

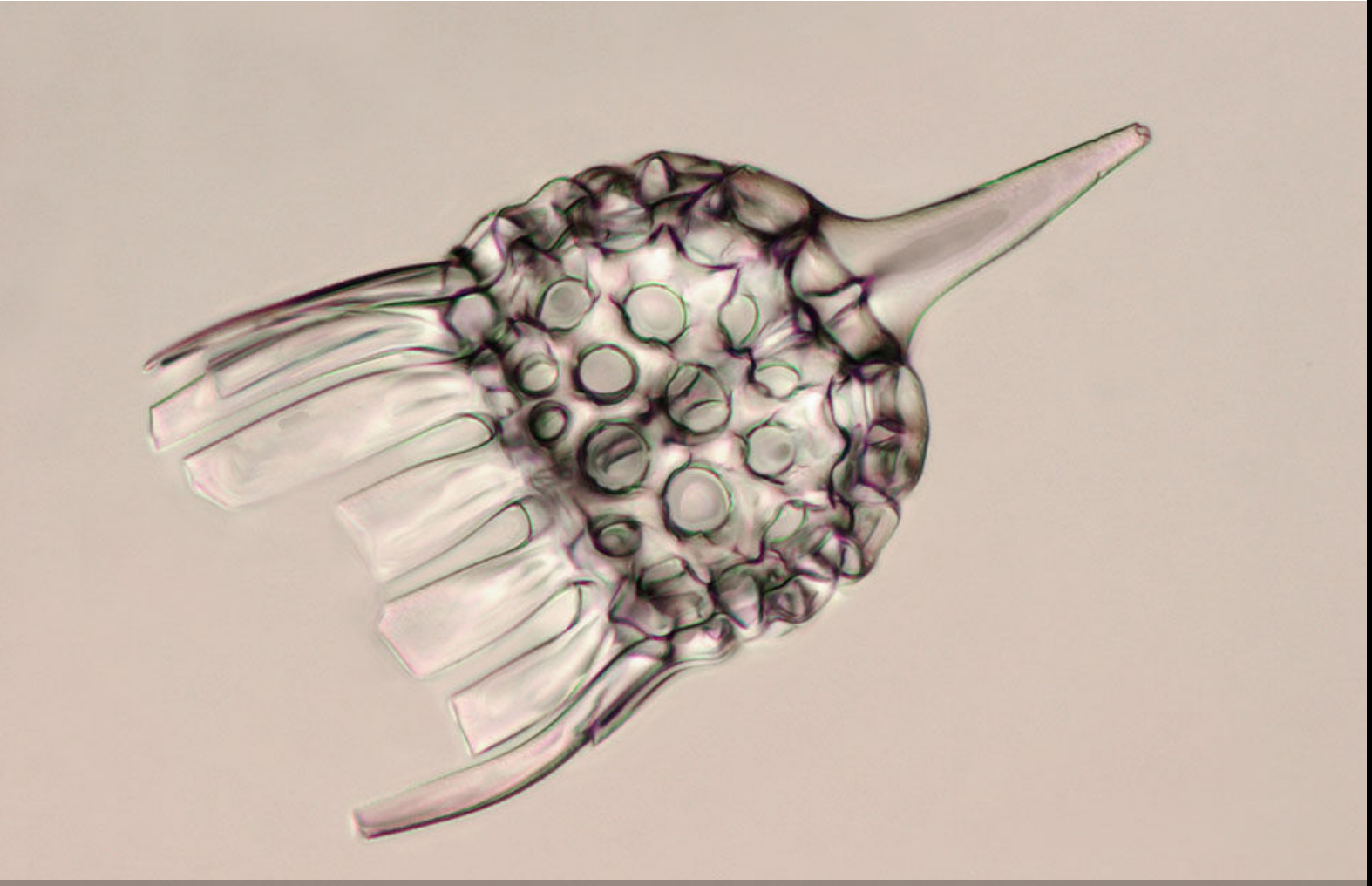


There were many ideas over the years about the small creatures the microscope had revealed. However, things became more 'clear' 160 years or so ago as to how these tiny things work and, for the first time in human history, humans understood that plants and animals are made up entirely of these structures we call cells. Just imagine that, until 160 years ago, humans did not know they were made up of cells.

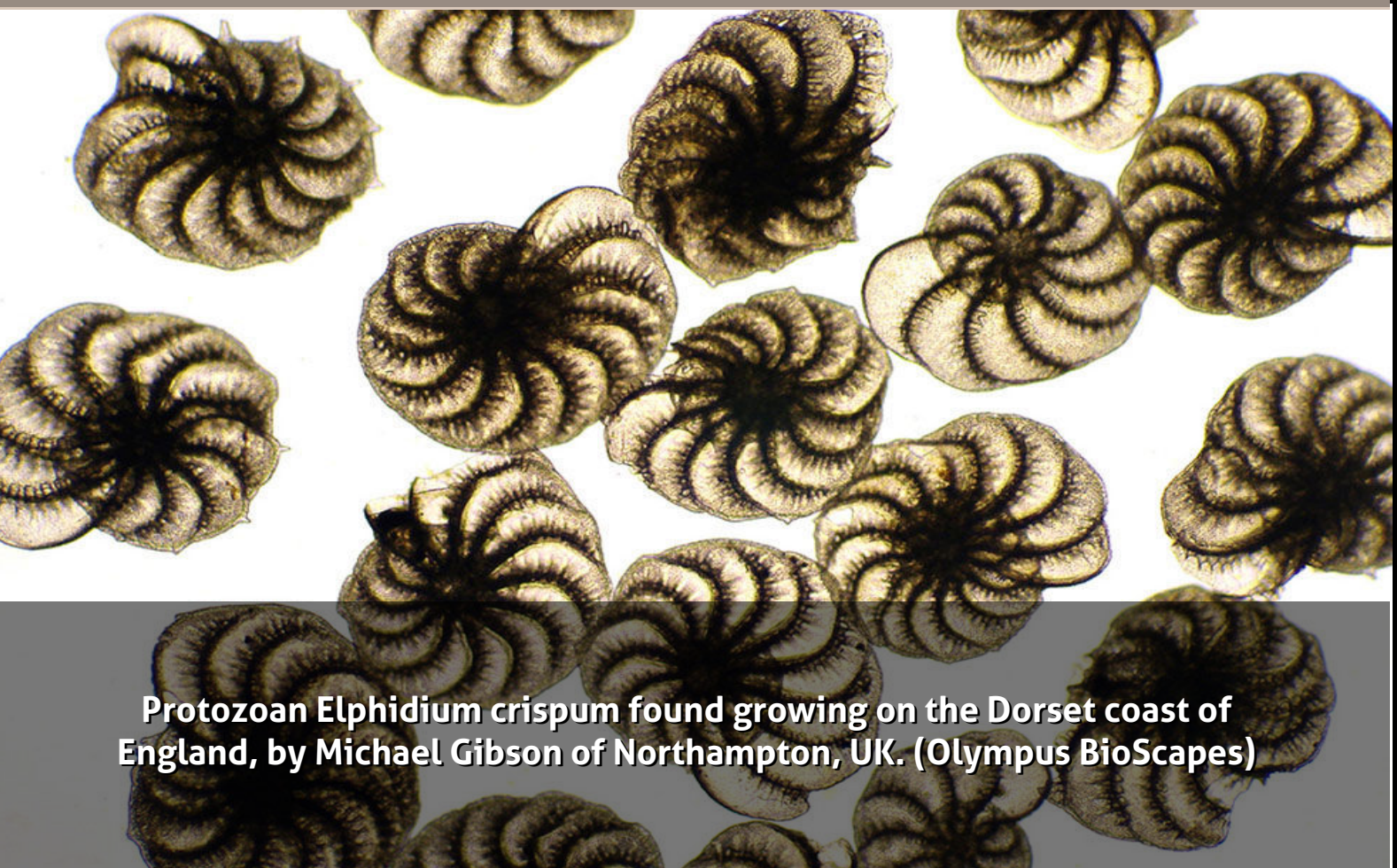
The discovery of these tiny creatures was a mind-changing revolution in science. For instance, people started to understand the mechanism of foods, life, fruits, and various microscopic structures. What they observed was not only cells, but also clusters of cells that formed tiny organisms. 150 or so years ago, a guy thought that maybe if you heat beer or wine enough to kill the micro-creatures that were 'lurking' in these substances, you could avoid them getting spoiled. And it worked! Today, we call it 'pasteurization', because that guy's name was Louis Pasteur :). See how some words come into existence!?

This method is widely used today for most foods. When someone tells you to boil water to make it safer to drink, they are basically telling you to kill billions of such tiny creatures, some of which may be harmful to you in sufficient quantities.

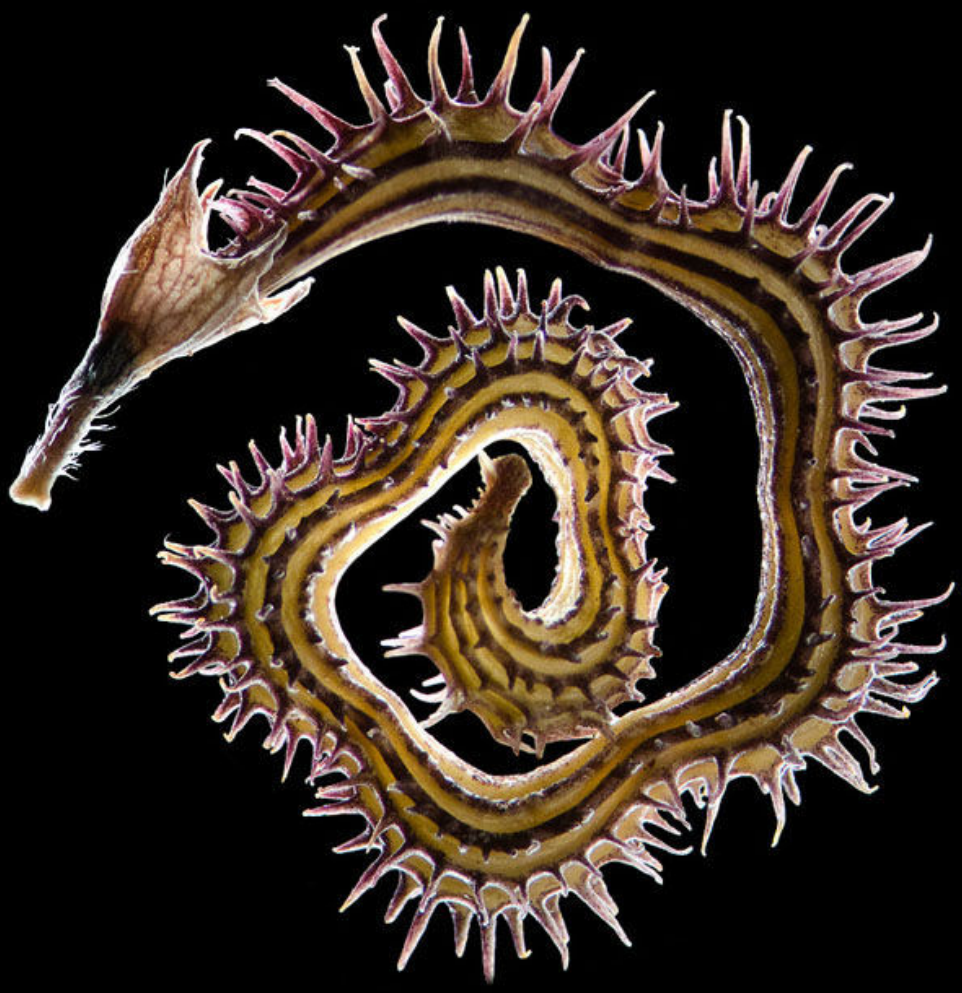




Skeleton of a radiolarian, a single-cell protozoan with an intricate mineral skeleton, by Christopher B. Jackson of Berne, Switzerland.



Protozoan Elphidium crispum found growing on the Dorset coast of England, by Michael Gibson of Northampton, UK. (Olympus BioScapes)



Detail of a pod of the flowering legume Scorpius muricatus (common name "Prickly Caterpillar"), by Viktor Sýkora, from Hyskov, Czech Republic.

Rotifer Floscularia ringens feeding. Its rapidly beating cilia (hair-like structures) bring water-containing food to the rotifer. Technique: Differential interference contrast microscopy.

This is a single-celled green diatom. Although many diatoms are found in the oceans, they inhabit freshwater too. Specimens for this composite image came from a lake.

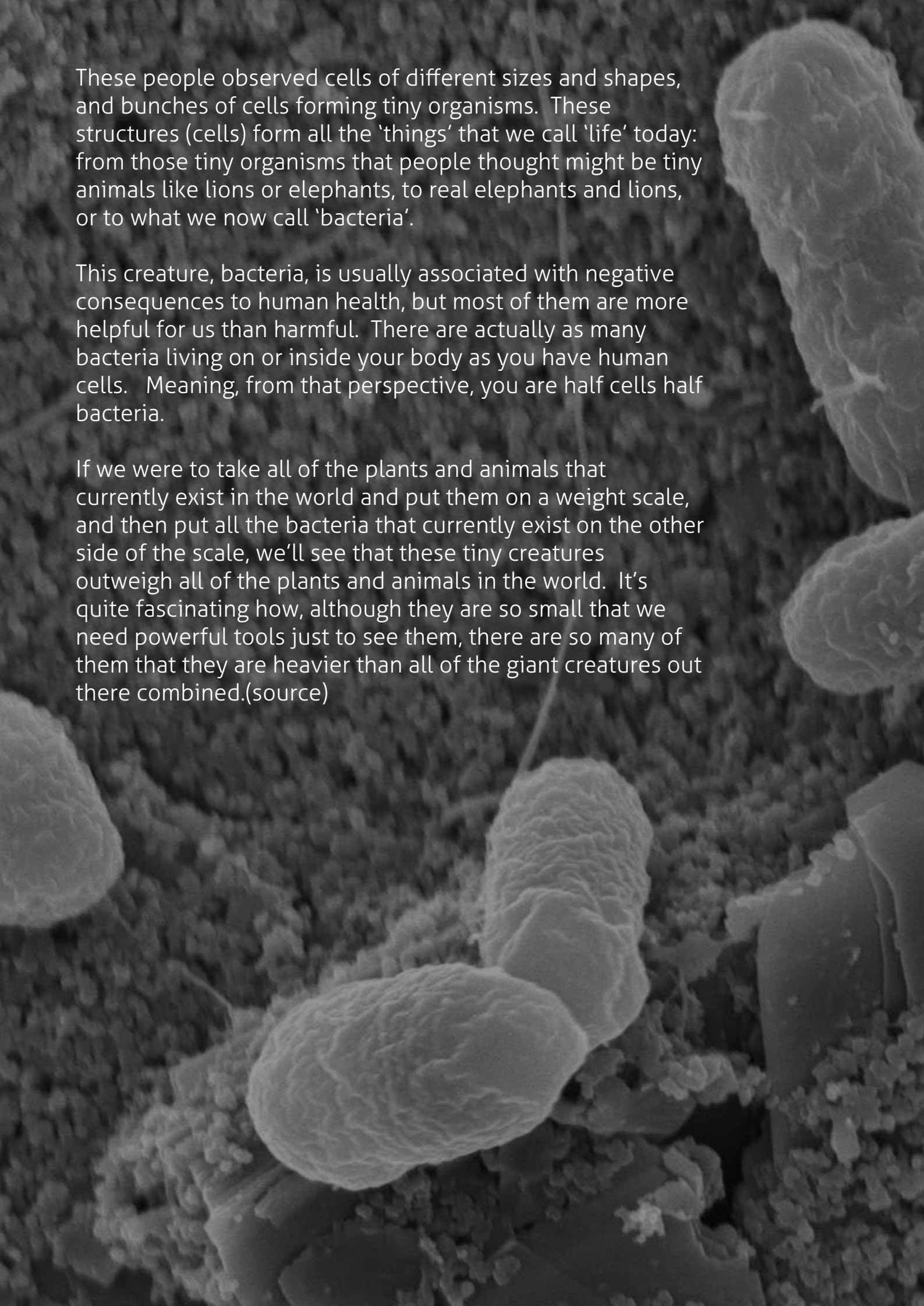
Branching red algae (brown) show off their reproductive spores (red), while golden diatoms—another kind of microscopic algae—cluster together like brightly colored leaves. This picture is taken by Arlene Wechezak of Washington.

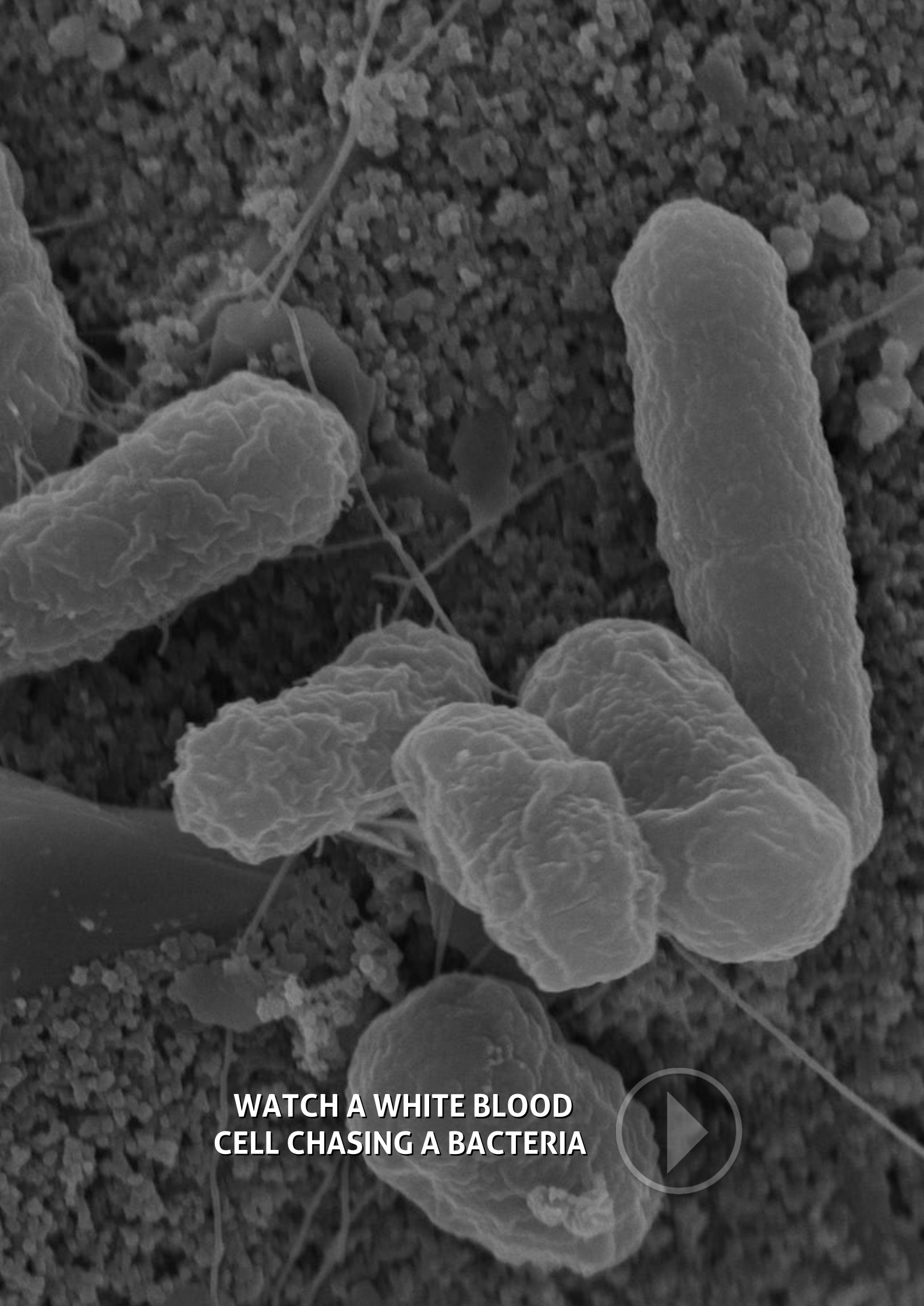
Spherical colonies of Nostoc commune, a bluegreen alga.Technique: Darkfield illumination. (Gerd Guenther/Duesseldorf, NRW, Germany)

These people observed cells of different sizes and shapes, and bunches of cells forming tiny organisms. These structures (cells) form all the 'things' that we call 'life' today: from those tiny organisms that people thought might be tiny animals like lions or elephants, to real elephants and lions, or to what we now call 'bacteria'.

This creature, bacteria, is usually associated with negative consequences to human health, but most of them are more helpful for us than harmful. There are actually as many bacteria living on or inside your body as you have human cells. Meaning, from that perspective, you are half cells half bacteria.

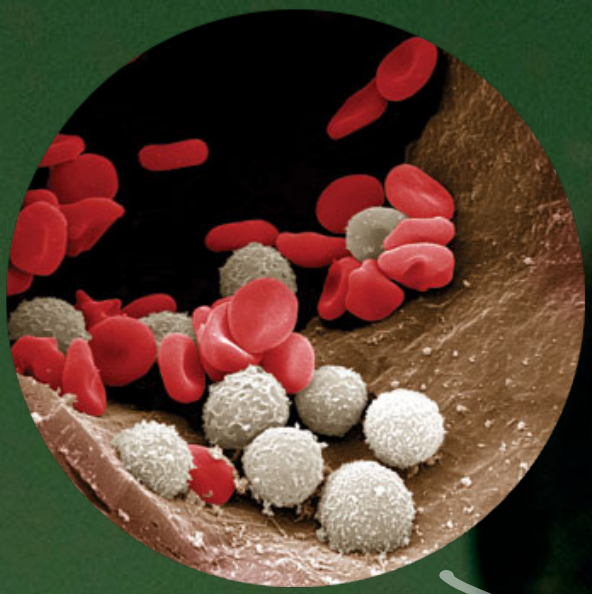
If we were to take all of the plants and animals that currently exist in the world and put them on a weight scale, and then put all the bacteria that currently exist on the other side of the scale, we'll see that these tiny creatures outweigh all of the plants and animals in the world. It's quite fascinating how, although they are so small that we need powerful tools just to see them, there are so many of them that they are heavier than all of the giant creatures out there combined.(source)




WATCH A WHITE BLOOD
CELL CHASING A BACTERIA

Thinking of 'human' cells again, the way that you and I are formed is quite extraordinary. Two cells, one from the female and one from the male, combine, and through a complicated process of exchanging even tinier structures between them (genetic structures inside these cells), they form a single cell that then divides into two, in a process that is more fantastic than any science fiction movie, and you can see this video that explains it in 3D to help yourself gain a stronger sense of it all.

Then the process continues as the two split into four, those four into eight, those eight into sixteen, and so on, until it has created the trillions of cells that we now call, "you": your feet, eyes, heart, brain, nerves bones, etc.. The next time you cut your finger and blood comes out, remember that you see it as a red liquid, but it's actually composed of millions/billions of tiny cells (red cells) that are simply escaping your body.



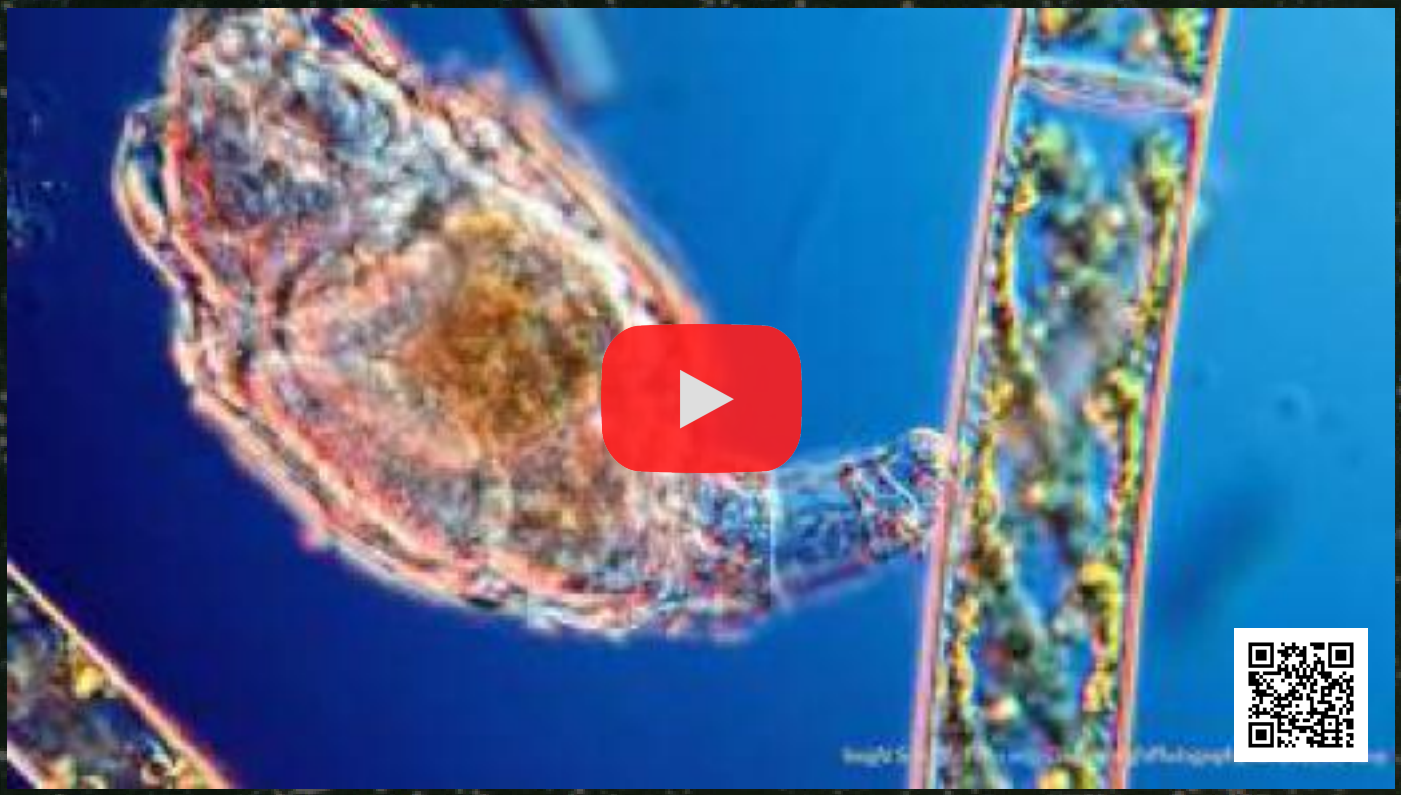
For instance, if you get hit in the face and your face swells and turns red, it is because tiny blood vessels (roadways) have been broken, and red cells are spilling into your facial tissue, where they cannot survive for long. The area eventually becomes brown and/or yellow and disappears.

Why? That's because other types of cells, white cells, respond to that event by coming to the 'accident' scene and eating the dead red cells. And the combination of white + red cells cause that yellow/brown colored 'bruise' on your face.

All of them gradually disappear, while the 'roadways' that were broken get fixed by white cells that fill in and repair the cracks in the blood vessels.

Many extraordinary events like these are taking place all of the time throughout your body: tiny creatures reacting/responding with each other, making you cough, develop a fever, run, think, breath, digest, live.(source 1, 2)

The microscopic life of creatures that are composed of one or more cells is a fascinating, alert and highly eventful world. Watch this amazing playlist to see their world, and follow this guy's YouTube channel for more such videos as they are released.

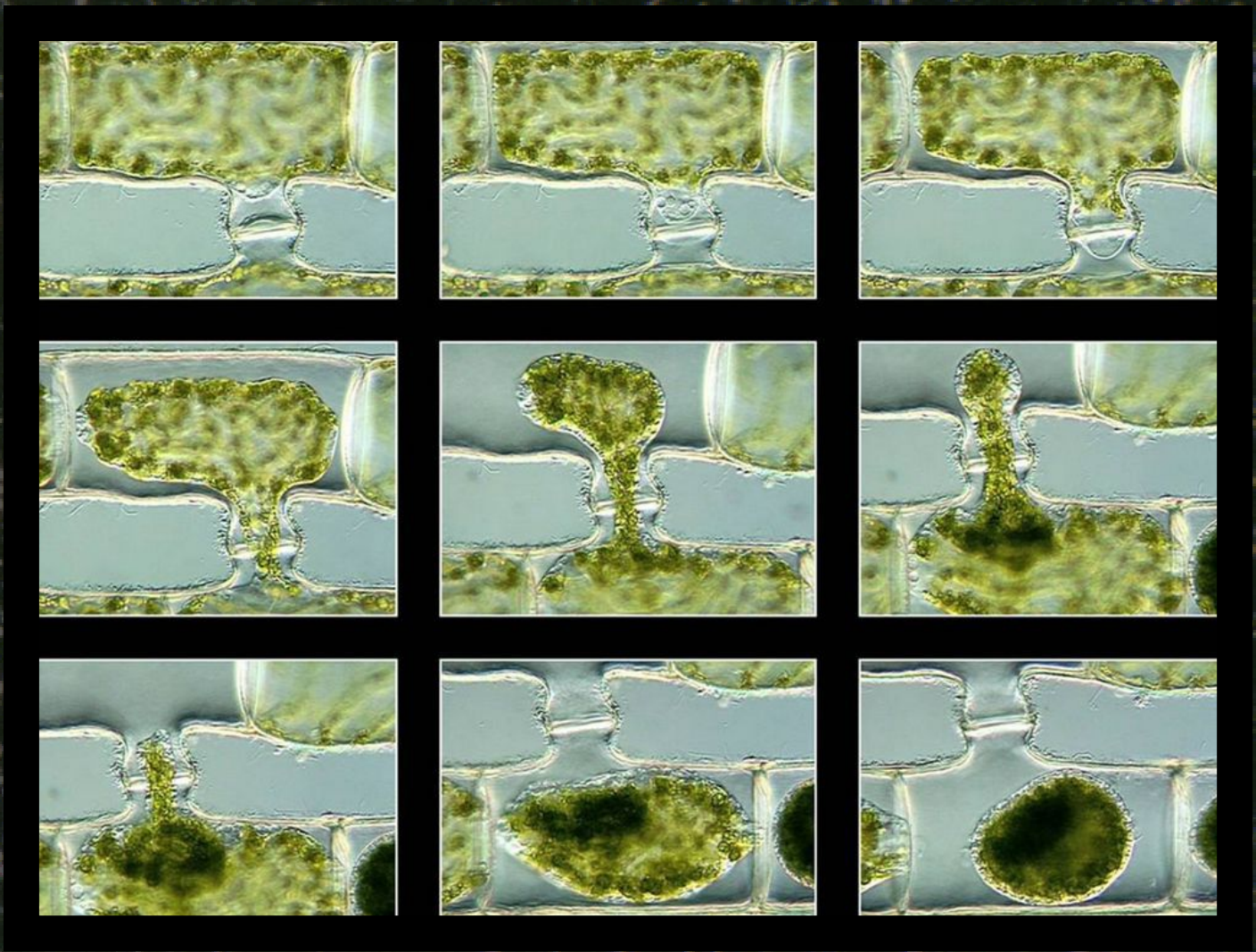


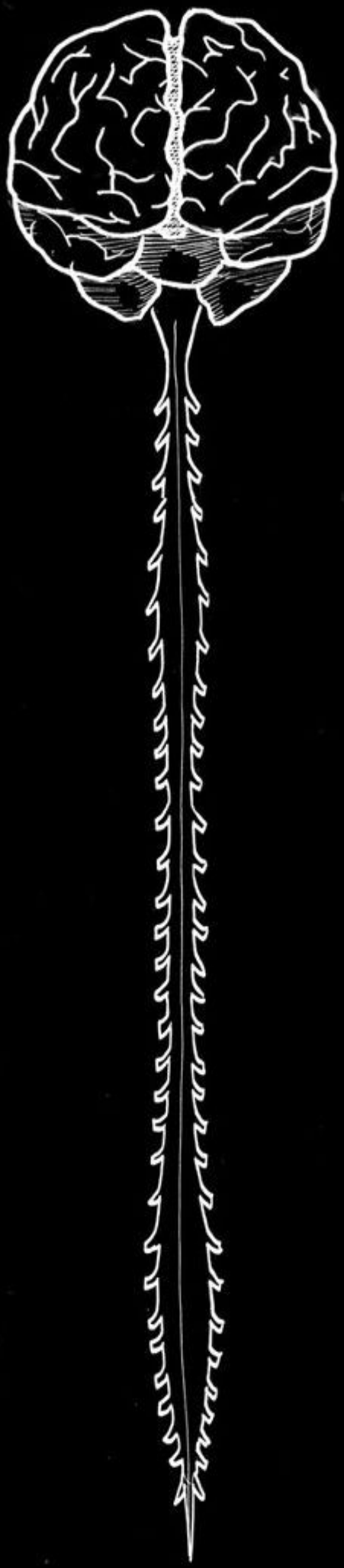
So, life as we know it is something made up entirely of cells. Some creatures self-replicate, while others often have to 'pair together' to engage in reproductive sex (meaning they have specialized male and female reproductive cells inside them, and those cells combine to make other creatures). For instance, while some lizards need to find a mate of the opposite sex in order to reproduce, other lizards are able to just make 'babies' without a partner.

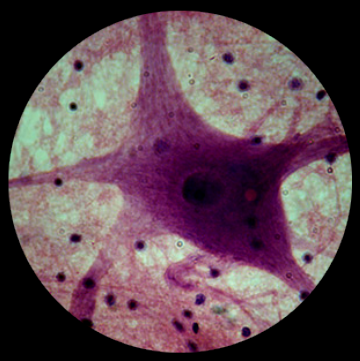
Occasional errors in the replication process of these cells give birth, literally, to new kinds of creatures, different from their parent(s). By combining that phenomenon with the 'sexual' reproductive process, which merges physical characteristics from both parents, we can now understand and explain the diversity of creatures that we see today; all of them combinations of errors in reproduction and combinations of characteristics.

AN ALGAE "SEX TAPE" SNAGGED THIRD PLACE IN THE 2009 BIOSCAPES COMPETITION.

BIOCHEMIST JEREMY PICKETT-HEAPS, OF AUSTRALIA'S UNIVERSITY OF MELBOURNE, FILMED THE CELLS SQUEEZING THROUGH NARROW FERTILIZATION TUBES THAT PARTNER CELLS HAD JUST BUILT BETWEEN THEM.





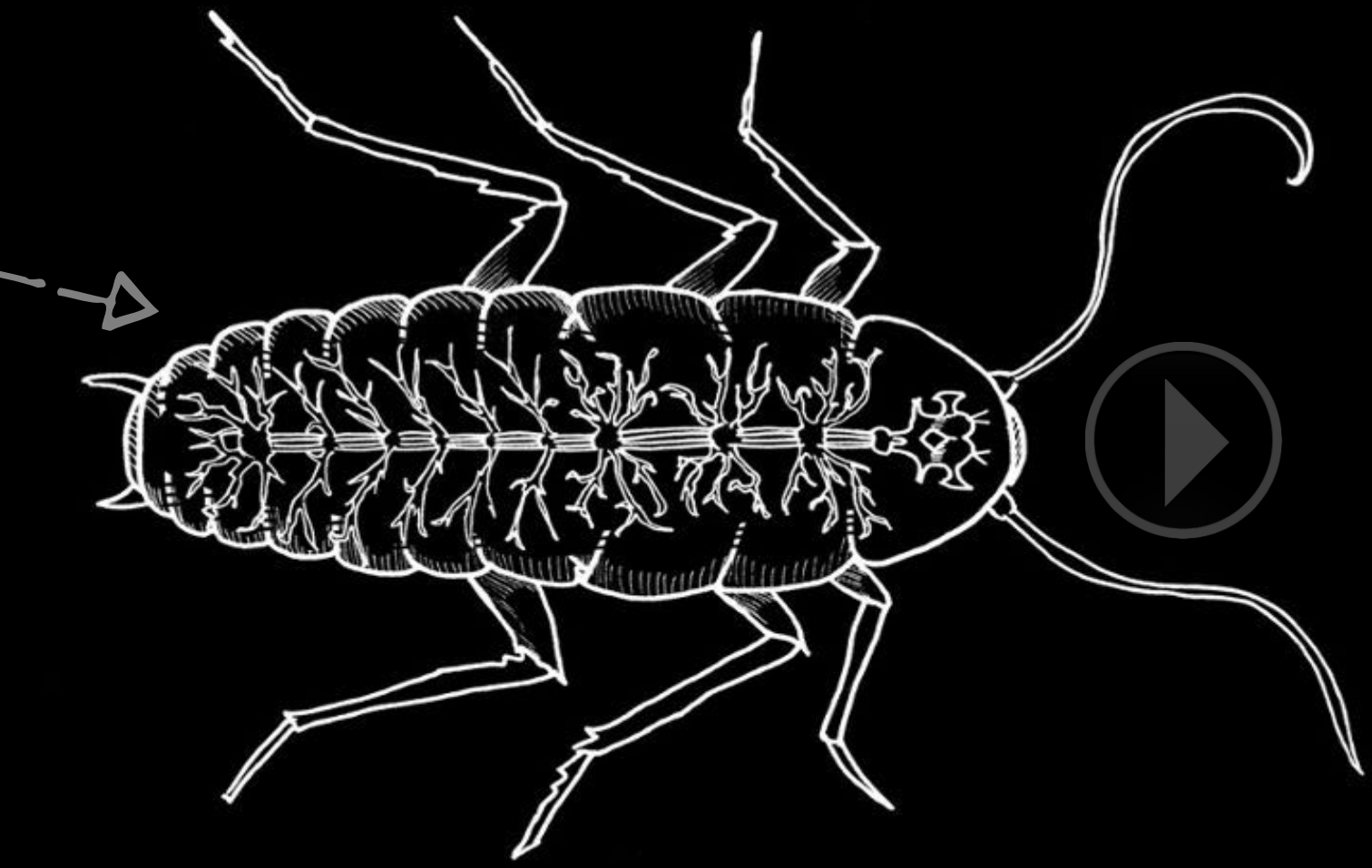


While a flower's growth is stimulated by all kinds of events/factors: water, soil moisture, gravity available sunlight, etc., other cell clusters, in the form of animals, are more complex because they form around a sophisticated nervous system inside the creature, creating the abilities of memory and 'behavior'.

Thus, a bug is far more complex in its behavior than a flower, because it has such a nervous system, which is made up of yet other kinds of cells (nerve cells).

A major part of our human nervous system is our brain, and if you cut off someone's head, the person dies, including their arms, legs, heart, etc.. That's due to the fact that 'who we are' is inside our brains, while our body will quickly bleed to death (no blood in the brain and the rest of the body, no life for the cells, no human).

We also breath through our mouths so, without one, there is no oxygen going inside our bodies even if we somehow stop the bleeding.



However, if you cut off a bug's head, it will still survive for some time because his 'brain' is a bunch of clustered nerve cells spread along its body. It will probably die of starvation since it now has no mouth, but it also has a different kind of blood, with different functionalities; a kind of blood that flows more freely through its body and doesn't bleed like ours. They also do not breath through their mouths, so it can walk around without a head for weeks.

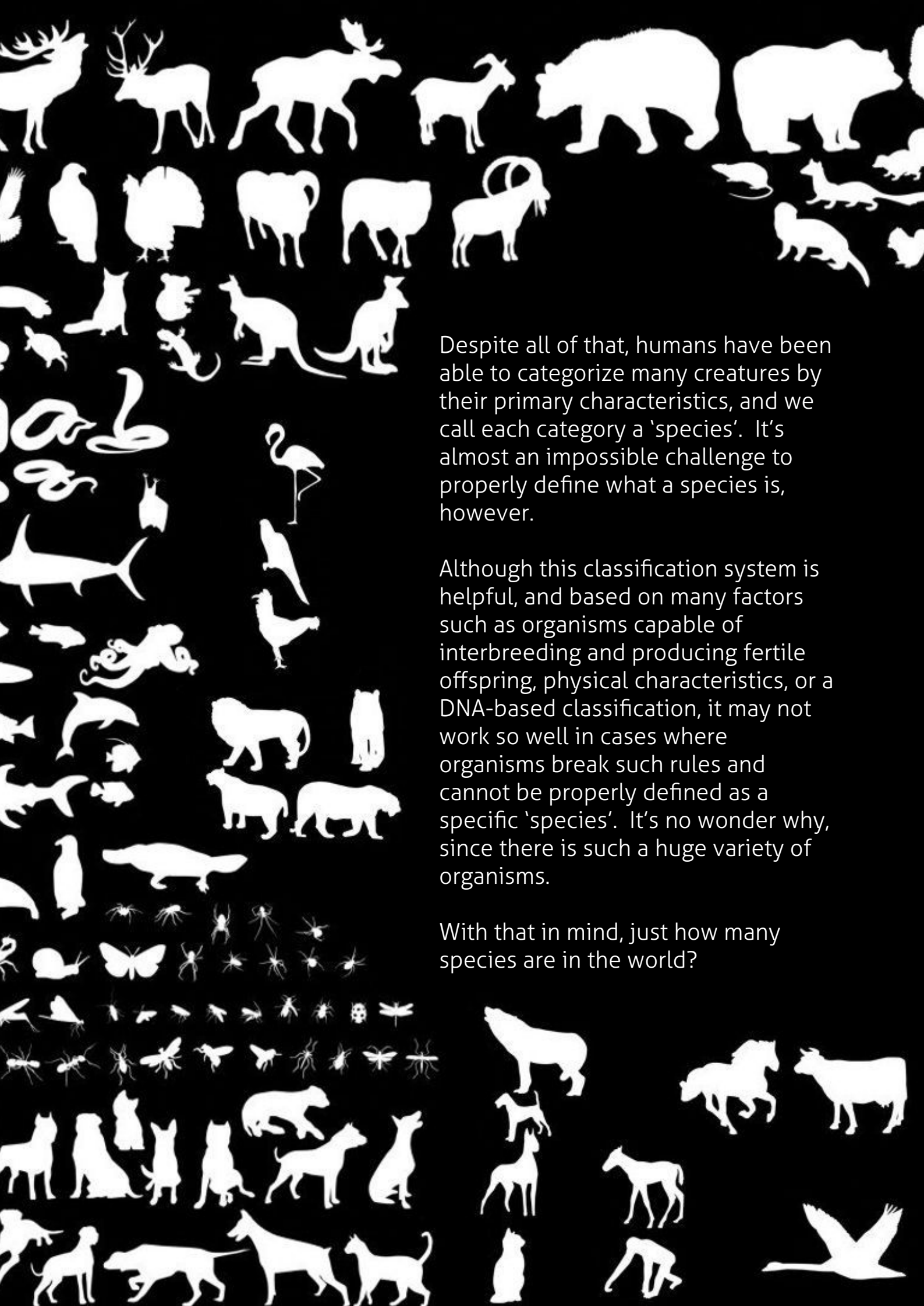
Even more interesting is that its head can survive even longer than its body, if provided with enough nutrients.(source)

Therefore, if we think of creatures in terms of heads and bodies (physical references), we may be wrong in our interpretation of the importance of a creature's form/organs. For instance, just as the 'brain' is a bunch of nerve cells distributed in many varied shapes and forms in different creatures, other organs are also often quite different from one creature to another. We have guts, hearts, stomachs and legs, while other creatures either have such organs in different sizes and forms, or performing somewhat different functions, or do not have them at all.

Another interesting fact is that if you take away one type of creatures like bacteria, the human creatures cannot exist. There are around 1,000 species of bacteria in the human gut alone. Without these creatures, we cannot digest food and are not provided the same protections against many diseases. We would also lack many other things that we absolutely depend on (chemicals).

There are so many creatures that live on and inside a human body that, to some alien species, we might appear like a zoo, or even an entire planet with its own inhabitants. Many of these creatures are smaller than human cells, and outnumber them by a lot.(source 1, 2)

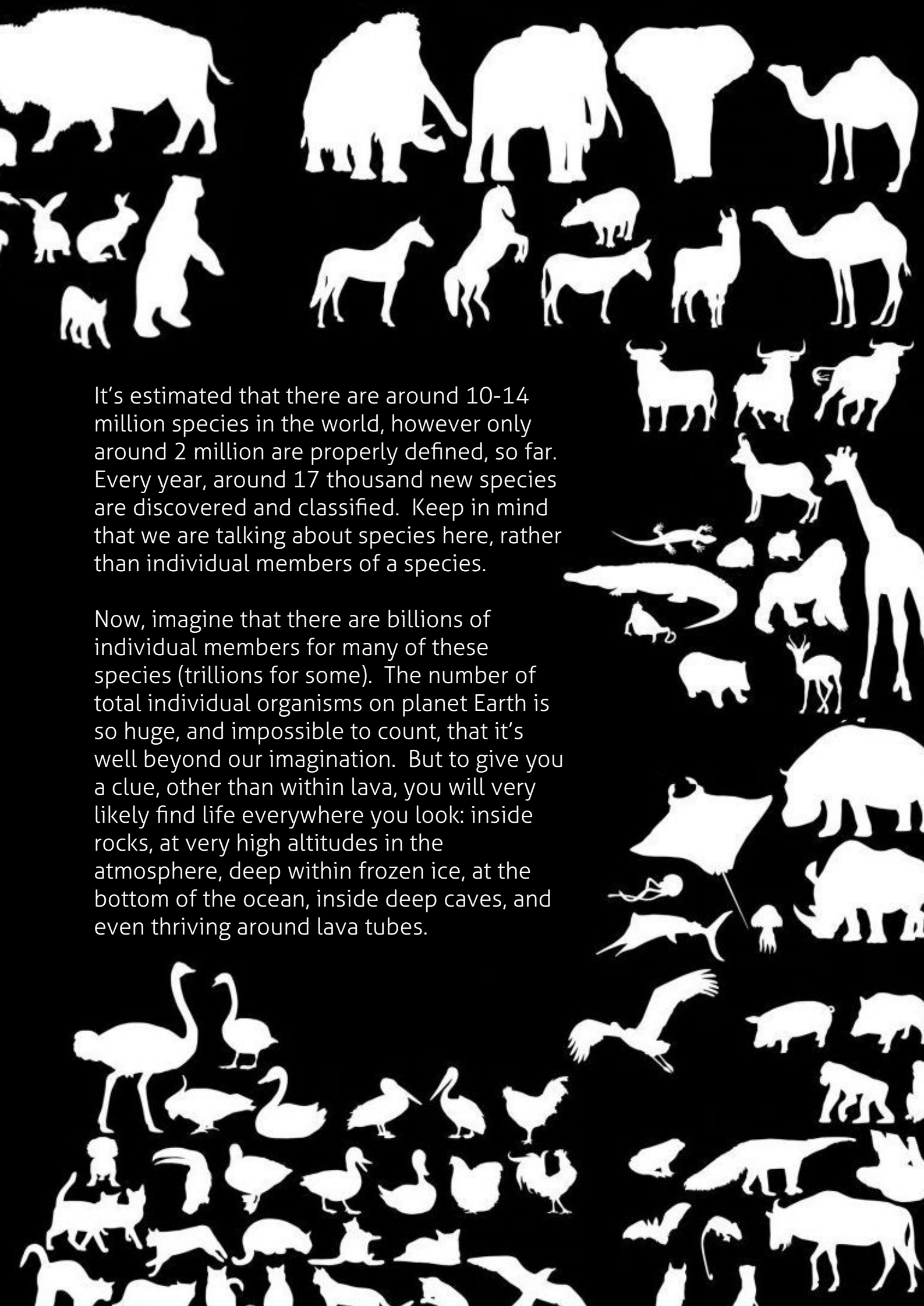
So, when we think of a creature, do we think of all of the complex 'thing' that it is? Why do we say bacteria is one creature and humans is another one? Maybe both should be viewed as a single symbiotic collective, where one could not survive without the other. You see, things are far more complex than we tend to think.



Despite all of that, humans have been able to categorize many creatures by their primary characteristics, and we call each category a 'species'. It's almost an impossible challenge to properly define what a species is, however.

Although this classification system is helpful, and based on many factors such as organisms capable of interbreeding and producing fertile offspring, physical characteristics, or a DNA-based classification, it may not work so well in cases where organisms break such rules and cannot be properly defined as a specific 'species'. It's no wonder why, since there is such a huge variety of organisms.

With that in mind, just how many species are in the world?



It's estimated that there are around 10-14 million species in the world, however only around 2 million are properly defined, so far. Every year, around 17 thousand new species are discovered and classified. Keep in mind that we are talking about species here, rather than individual members of a species.

Now, imagine that there are billions of individual members for many of these species (trillions for some). The number of total individual organisms on planet Earth is so huge, and impossible to count, that it's well beyond our imagination. But to give you a clue, other than within lava, you will very likely find life everywhere you look: inside rocks, at very high altitudes in the atmosphere, deep within frozen ice, at the bottom of the ocean, inside deep caves, and even thriving around lava tubes.

This is how many creatures are in a typical drop of seawater

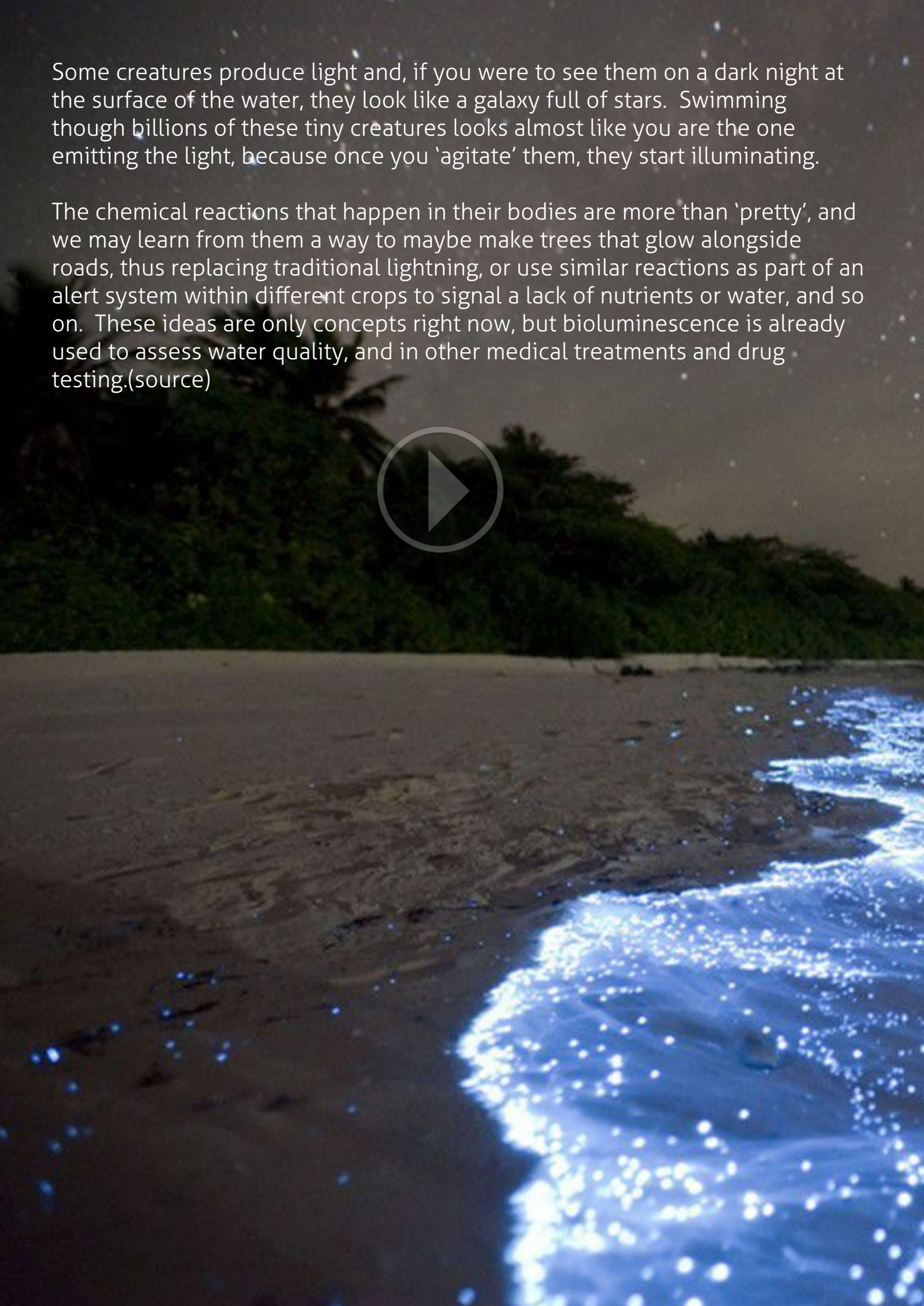
So, let’s have a look at some of the more interesting, complex and unusual creatures that exist (of course, it's ‘nuts’ to make such a list without realizing that you can only highlight 0.00000001% of them, but we’re going to do it anyway ;)).

>>>>

If you cut one of this creature's limbs, it can regrow it back within a month, fully functional. If we figure it out how it does this, we might learn, perhaps, how to regrow many of our organs, which would be a revolution in the way we deal with broken 'parts' of our body.

Some creatures produce light and, if you were to see them on a dark night at the surface of the water, they look like a galaxy full of stars. Swimming though billions of these tiny creatures looks almost like you are the one emitting the light, because once you 'agitate' them, they start illuminating.

The chemical reactions that happen in their bodies are more than 'pretty', and we may learn from them a way to maybe make trees that glow alongside roads, thus replacing traditional lightning, or use similar reactions as part of an alert system within different crops to signal a lack of nutrients or water, and so on. These ideas are only concepts right now, but bioluminescence is already used to assess water quality, and in other medical treatments and drug testing.(source)

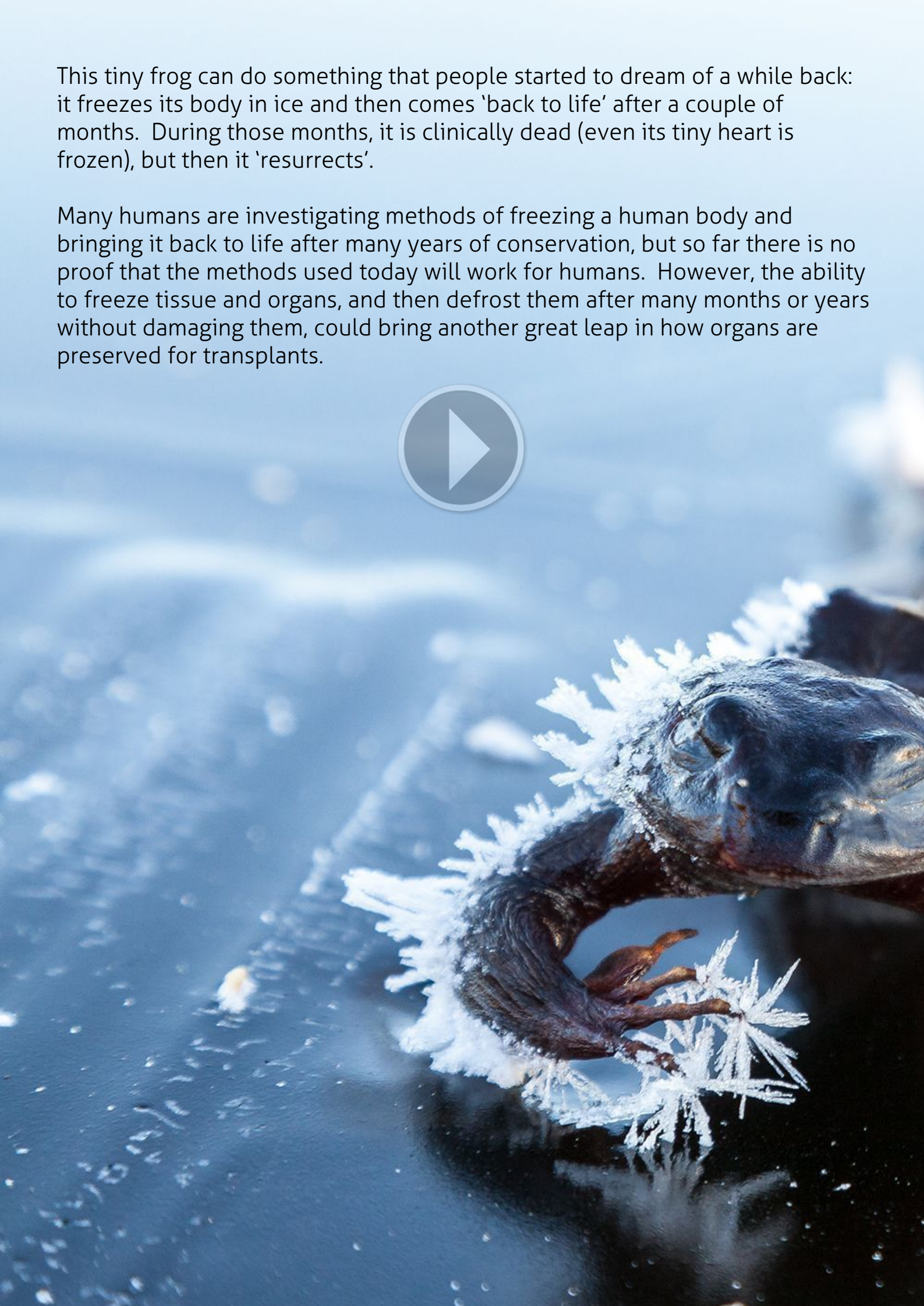



Waitomo Glowworm Caves

Luminescent Panellus

This tiny frog can do something that people started to dream of a while back: it freezes its body in ice and then comes 'back to life' after a couple of months. During those months, it is clinically dead (even its tiny heart is frozen), but then it 'resurrects'.

Many humans are investigating methods of freezing a human body and bringing it back to life after many years of conservation, but so far there is no proof that the methods used today will work for humans. However, the ability to freeze tissue and organs, and then defrost them after many months or years without damaging them, could bring another great leap in how organs are preserved for transplants.



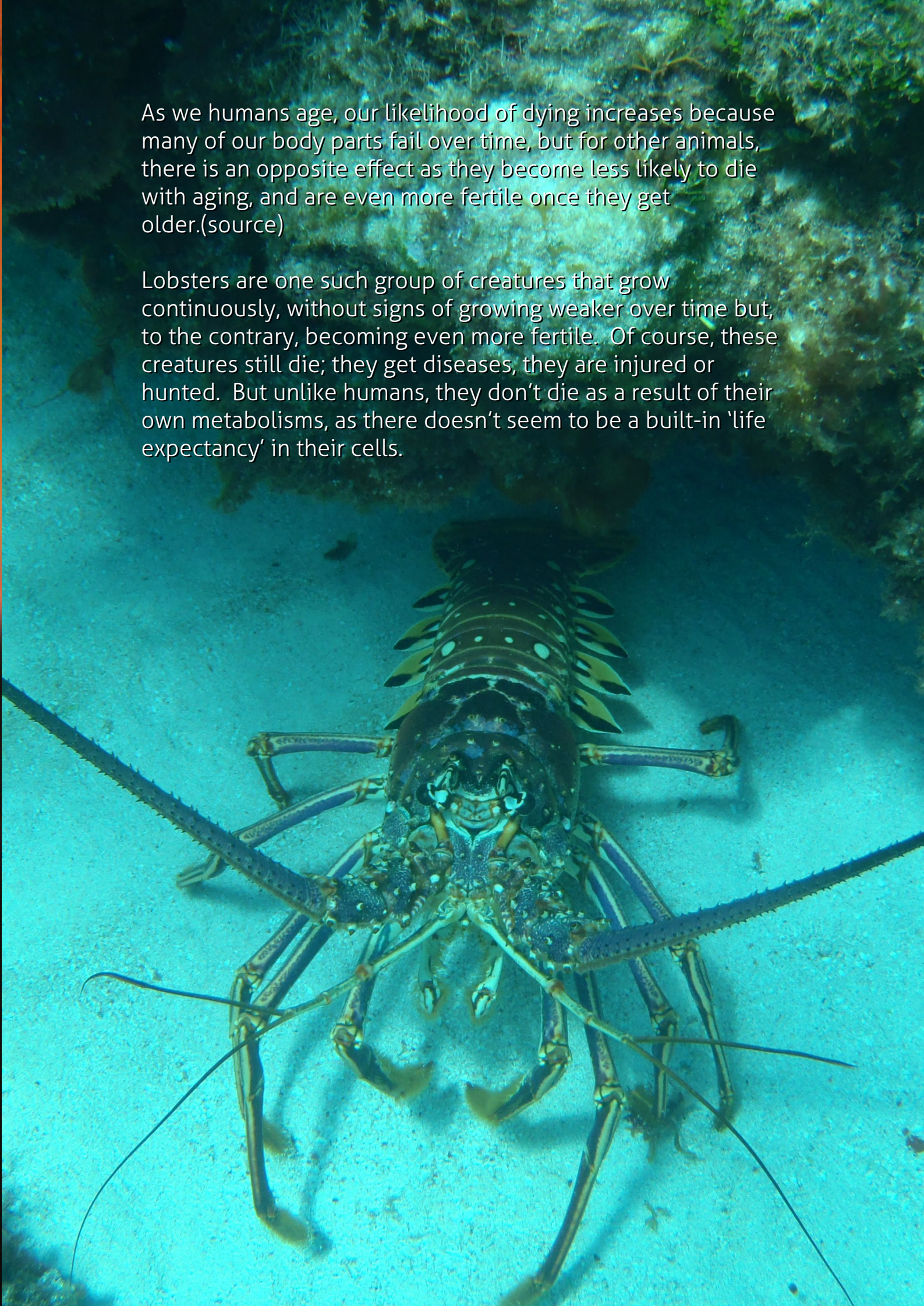
While that frog will eventually die, although it slows down its aging process by freezing its body over the winter, one creature goes beyond that and never dies. It gets older, but then gets 'younger' and divides into clones of itself, and then those clones grow up, getting older and continuing the process 'forever'. It is the only known creature that can do this.

Imagine if we can unlock this creature's secrets...

Some creatures do not get 'old' in the way we are used to, or at all. Hydra magnipapillata is a tiny creature and it is thought that if you were to move its population (species) into a laboratory to protect them from external factors that can kill them, it would take 1,400 years for 95% of the population to die from natural causes.

As we humans age, our likelihood of dying increases because many of our body parts fail over time, but for other animals, there is an opposite effect as they become less likely to die with aging, and are even more fertile once they get older.(source)

Lobsters are one such group of creatures that grow continuously, without signs of growing weaker over time but, to the contrary, becoming even more fertile. Of course, these creatures still die; they get diseases, they are injured or hunted. But unlike humans, they don't die as a result of their own metabolisms, as there doesn't seem to be a built-in 'life expectancy' in their cells.



This weird looking creature is actually so tiny that you can't see it with your naked eye, but what is special about it is how he reproduces.

For the past 80 million years, she (scientists have never discovered a male for this species) is thought to reproduce by borrowing DNA from other creatures, making these creatures a kind of genetic mosaic. (source)

You can chop off the heads of these creatures and they will just grow back another one.

Although they are water creatures, they can survive without water for 9 years, and that they can also absorb 250 times more radiations than humans, without harm.

Different creatures experience the world in different ways. Their main sense may be that of smell, so the world would look very different to such a creature. Some may feel the magnetic field of the Earth, while others use sound or feel heat to map their world. Different senses, bringing different 'views' of the world. The way that we humans perceive the world is just one of many possibilities provided by nature's evolution.

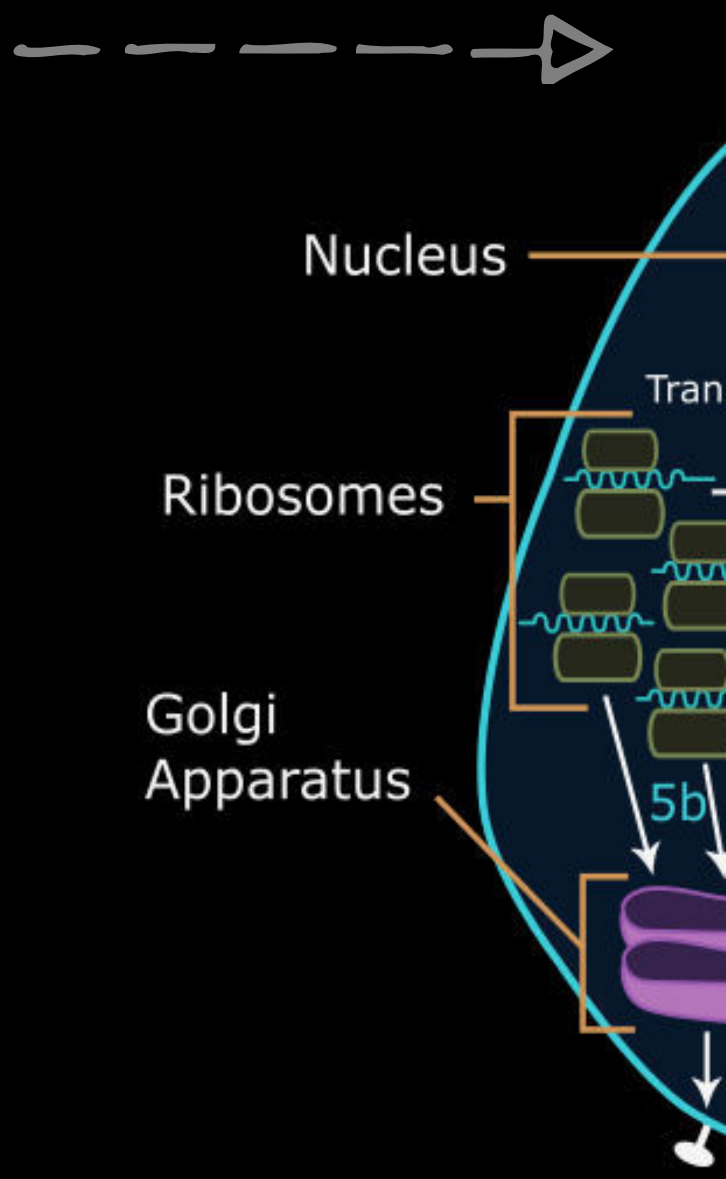
There are so many creatures on this planet, and they are so different from one another, that it is astonishingly hard to highlight just a few of them when there are so many to choose from. Instead, I'll provide you with a bunch of photos of such creatures without telling you anything about them, and if you consider them amazing, just click their photo to read more about them. This way, you get to test your curiosity and, if your brain wants to learn more about one or more of them, then you will investigate further the living world of this planet. (these images are not 'photoshopped', by the way)

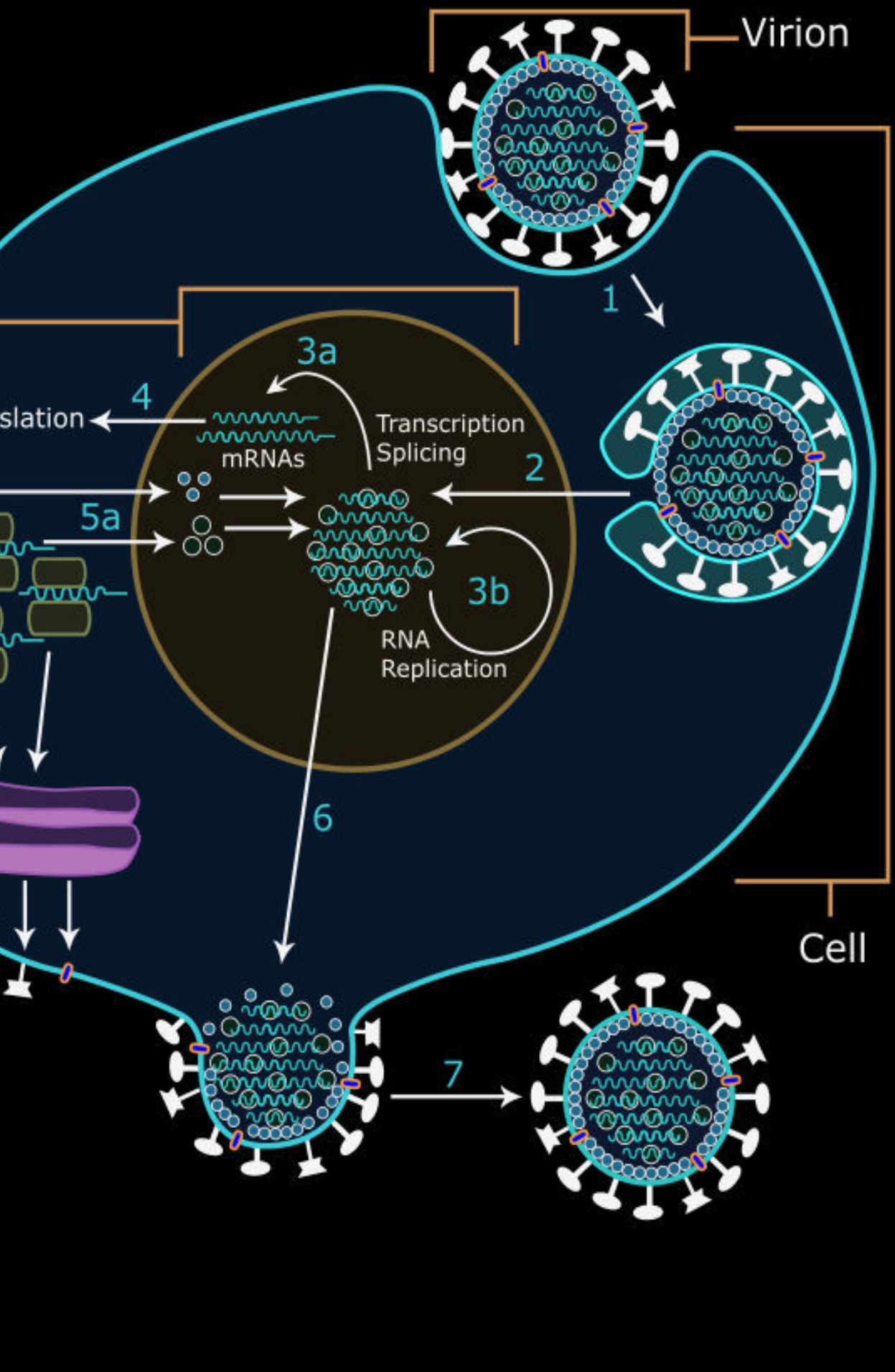

SUZUKI
AVON

All the creatures you have seen so far are cell-based creatures. However, if we look at viruses, which are just structures made up of different things other than cells, we can regard them as being 'alive', as well.

In order for a virus to reproduce, it must sneak inside of a living cell and use that cell's reproductive systems to produce more of its own kind.

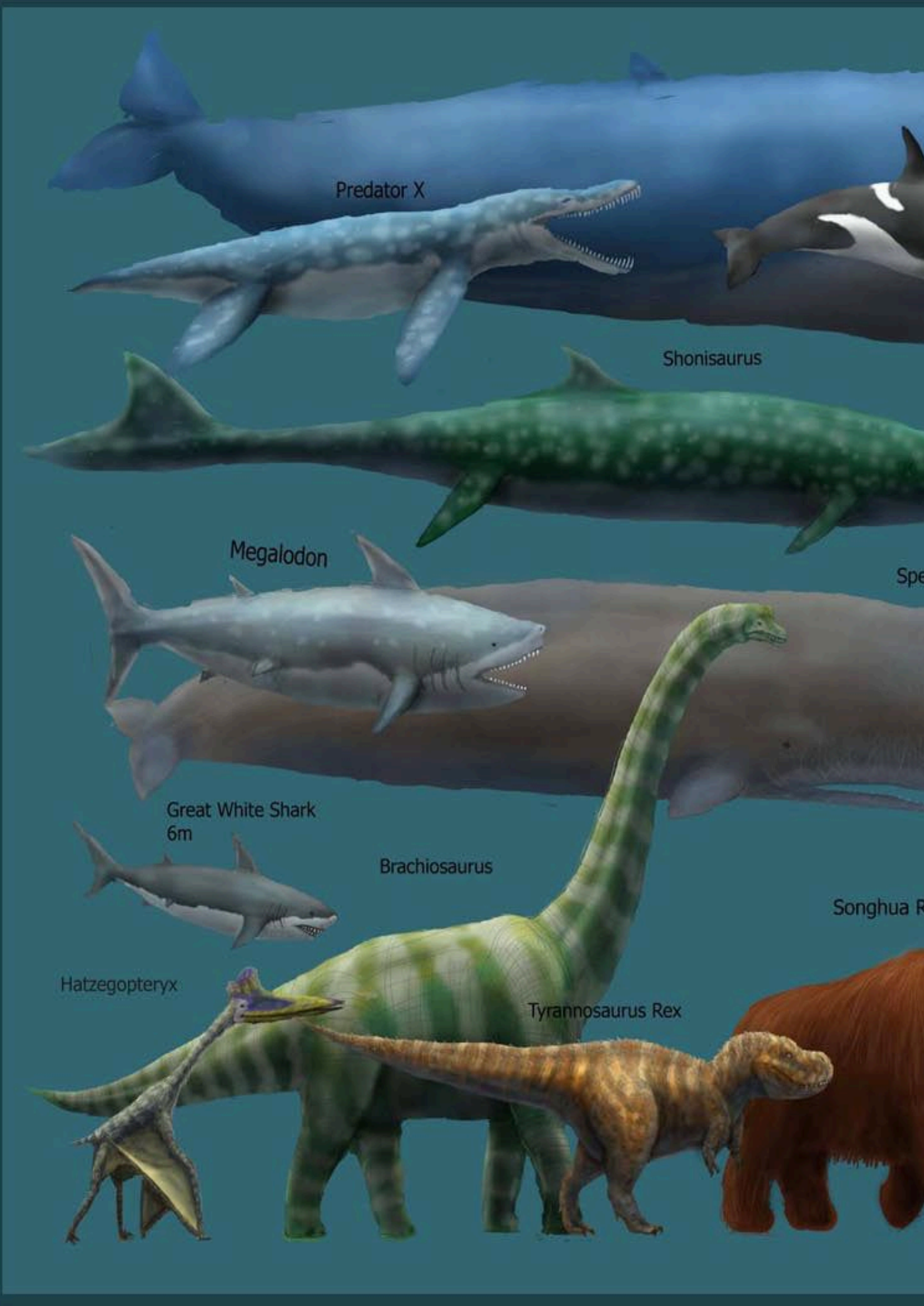
Does that make it alive? You decide. But if you conclude that they are more like machines than living creatures, then remember that we also need an environment to reproduce ourselves, similar to how the virus needs the cell.



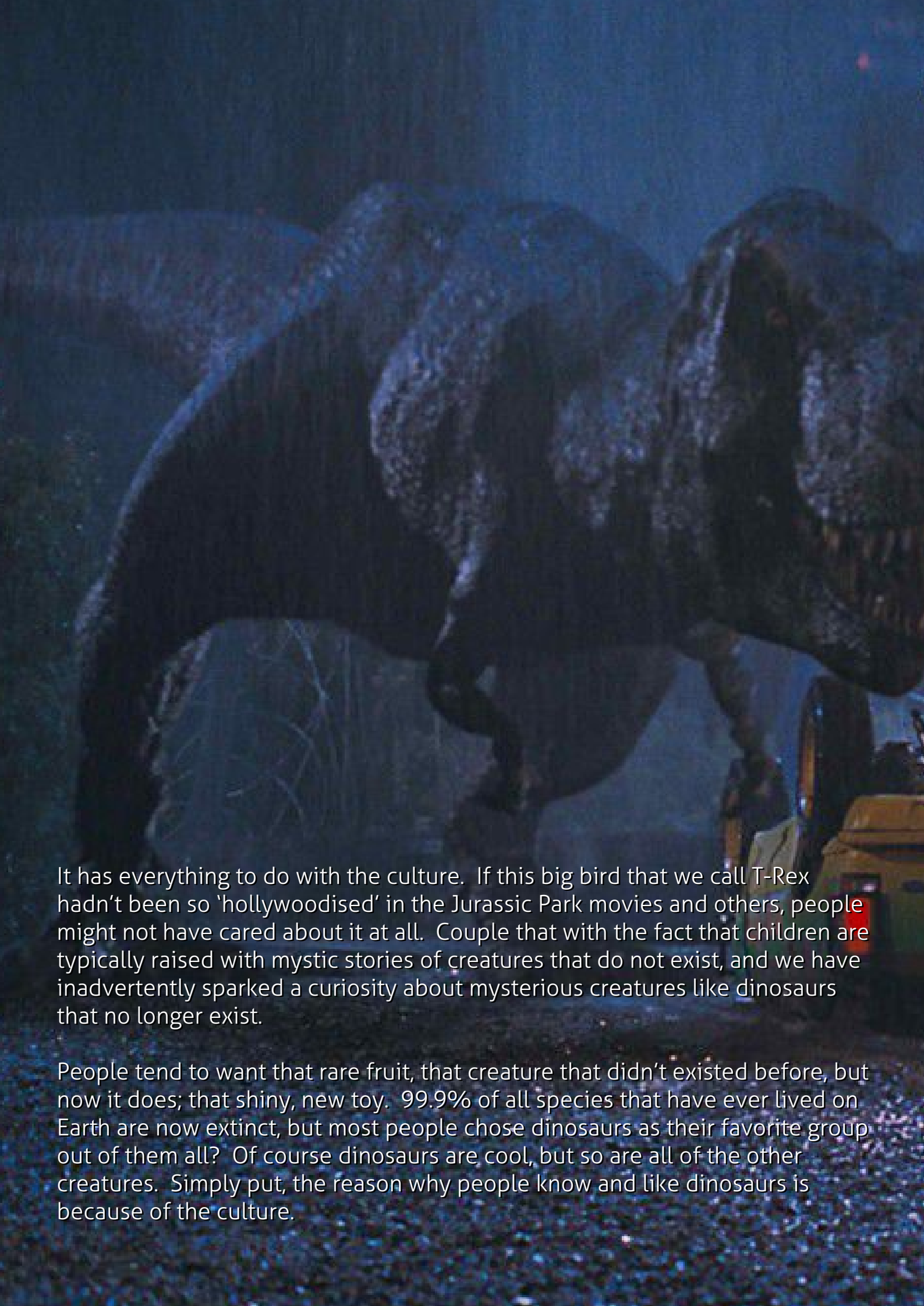

Virion
1
3a
4
slation
mRNAs
Transcription
Splicing
2
5a
3b
RNA
Replication
6
Cell
7

Let's think about creatures in a societal context now. Consider the Blue Whale. It is the largest creature that has ever existed, yet, not so many people seem impressed by that. Why not?

If a real "Jurassic Park" were to open tomorrow, where you could see cloned real-life dinosaurs, I bet the tickets would have been sold out years before the opening. Why are people so keen to see T-Rex, but not a Blue Whale?


Predator X
Shonisaurus
Megalodon
Spe
Great White Shark
6m
Brachiosaurus
Songhua R
Hatzegopteryx
Tyrannosaurus Rex

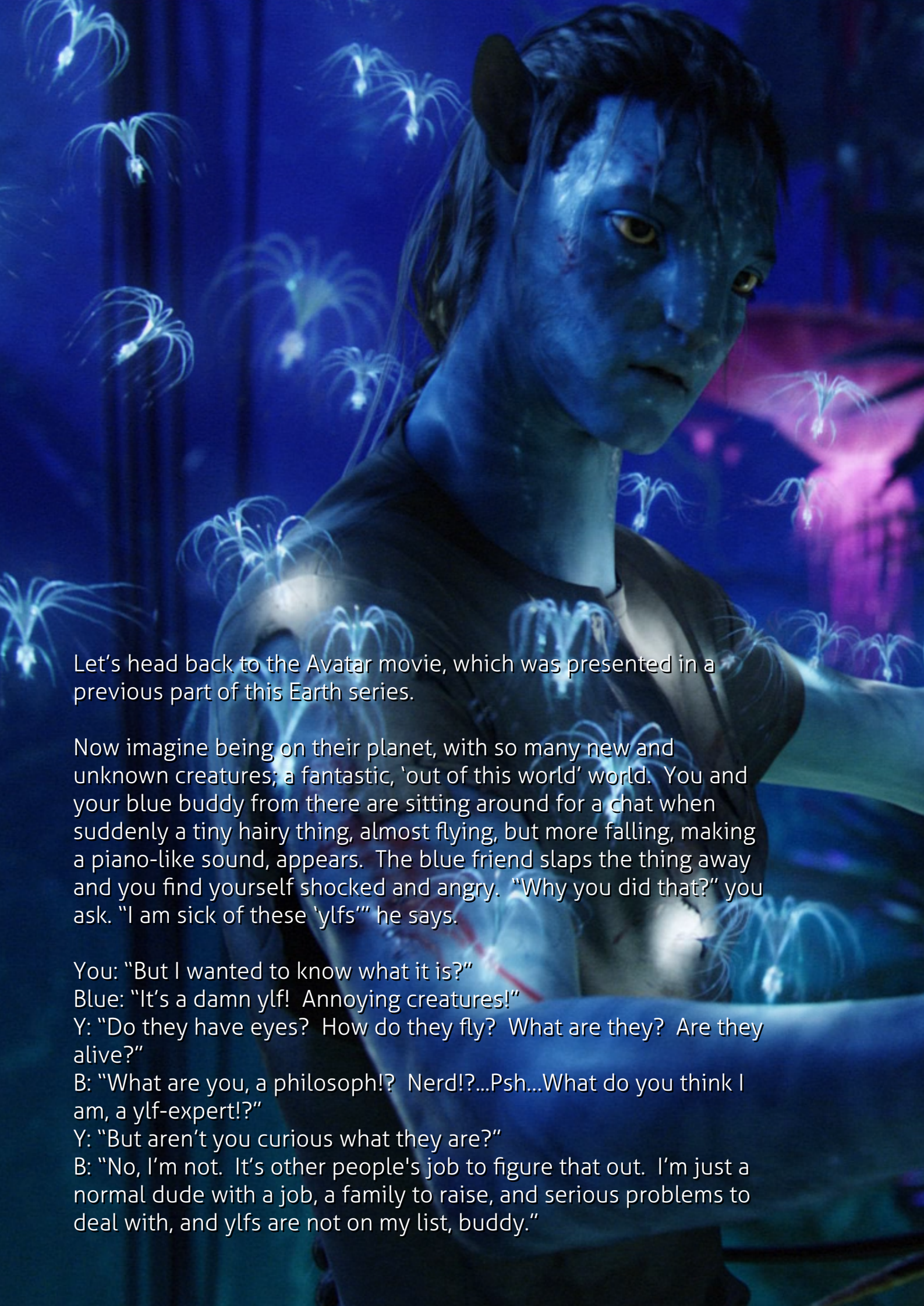

Orca
Blue Whale
Leedsichthys
erm Whale
Leviathan Melville
Mososaurus Beaugei
Temnodontosaurus
River Mammoth
African Bush Elephant
Triceratops
Human



It has everything to do with the culture. If this big bird that we call T-Rex hadn't been so 'hollywoodised' in the Jurassic Park movies and others, people might not have cared about it at all. Couple that with the fact that children are typically raised with mystic stories of creatures that do not exist, and we have inadvertently sparked a curiosity about mysterious creatures like dinosaurs that no longer exist.

People tend to want that rare fruit, that creature that didn't existed before, but now it does; that shiny, new toy. 99.9% of all species that have ever lived on Earth are now extinct, but most people chose dinosaurs as their favorite group out of them all? Of course dinosaurs are cool, but so are all of the other creatures. Simply put, the reason why people know and like dinosaurs is because of the culture.

If the real world were presented to children (and to people of all ages) in the same way that the Jurassic Park movie was presented, then people would have much more realistic drives, motivations, and curiosities.



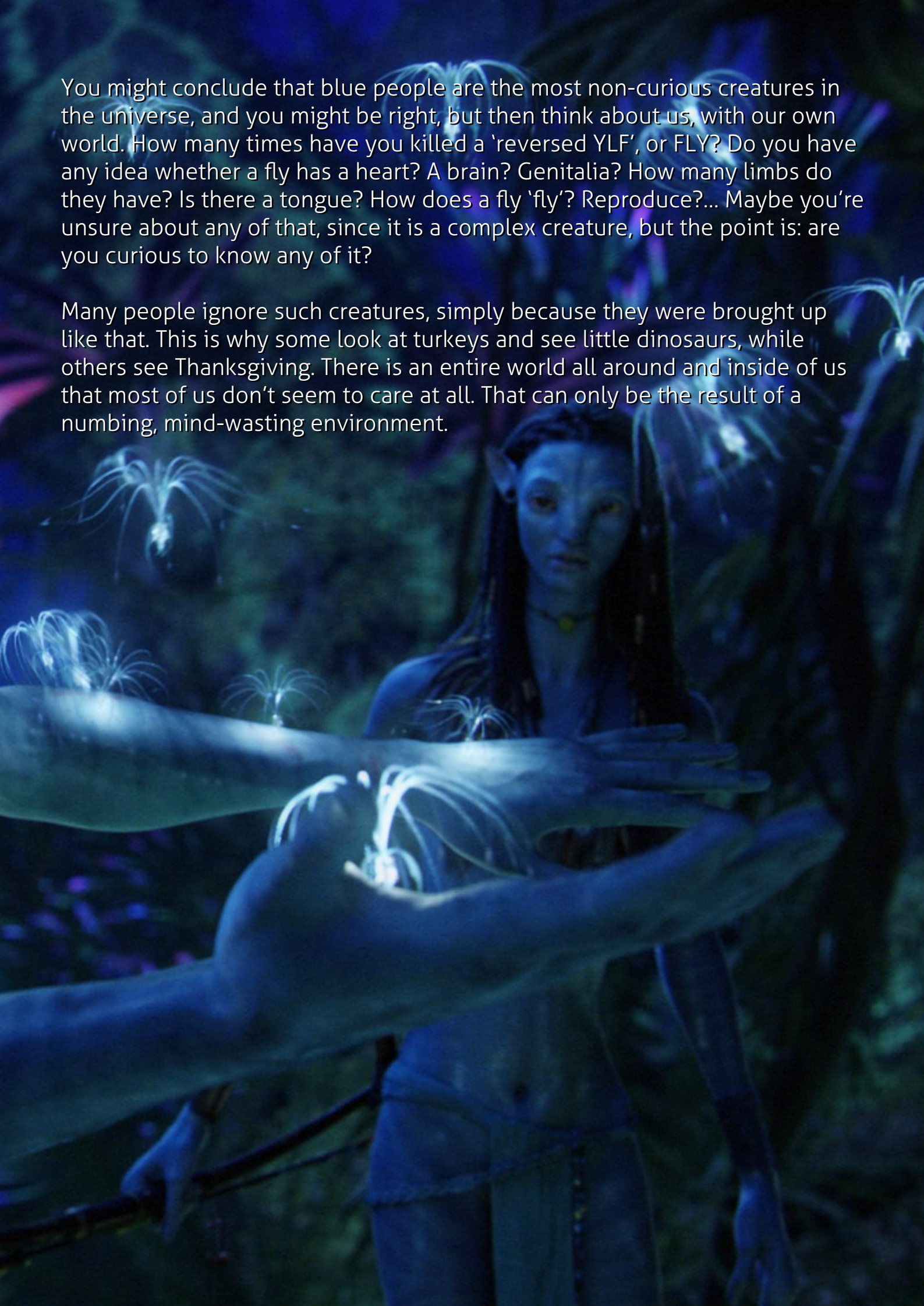
Let's head back to the Avatar movie, which was presented in a previous part of this Earth series.

Now imagine being on their planet, with so many new and unknown creatures; a fantastic, 'out of this world' world. You and your blue buddy from there are sitting around for a chat when suddenly a tiny hairy thing, almost flying, but more falling, making a piano-like sound, appears. The blue friend slaps the thing away and you find yourself shocked and angry. "Why you did that?" you ask. "I am sick of these 'ylfs'" he says.

You: "But I wanted to know what it is?"
Blue: "It's a damn ylf! Annoying creatures!"
Y: "Do they have eyes? How do they fly? What are they? Are they alive?"
B: "What are you, a philosoph!? Nerd!?...Psh...What do you think I am, a ylf-expert!?"
Y: "But aren't you curious what they are?"
B: "No, I'm not. It's other people's job to figure that out. I'm just a normal dude with a job, a family to raise, and serious problems to deal with, and ylfs are not on my list, buddy."

You might conclude that blue people are the most non-curious creatures in the universe, and you might be right, but then think about us, with our own world. How many times have you killed a 'reversed YLF', or FLY? Do you have any idea whether a fly has a heart? A brain? Genitalia? How many limbs do they have? Is there a tongue? How does a fly 'fly'? Reproduce?... Maybe you're unsure about any of that, since it is a complex creature, but the point is: are you curious to know any of it?

Many people ignore such creatures, simply because they were brought up like that. This is why some look at turkeys and see little dinosaurs, while others see Thanksgiving. There is an entire world all around and inside of us that most of us don't seem to care at all. That can only be the result of a numbing, mind-wasting environment.

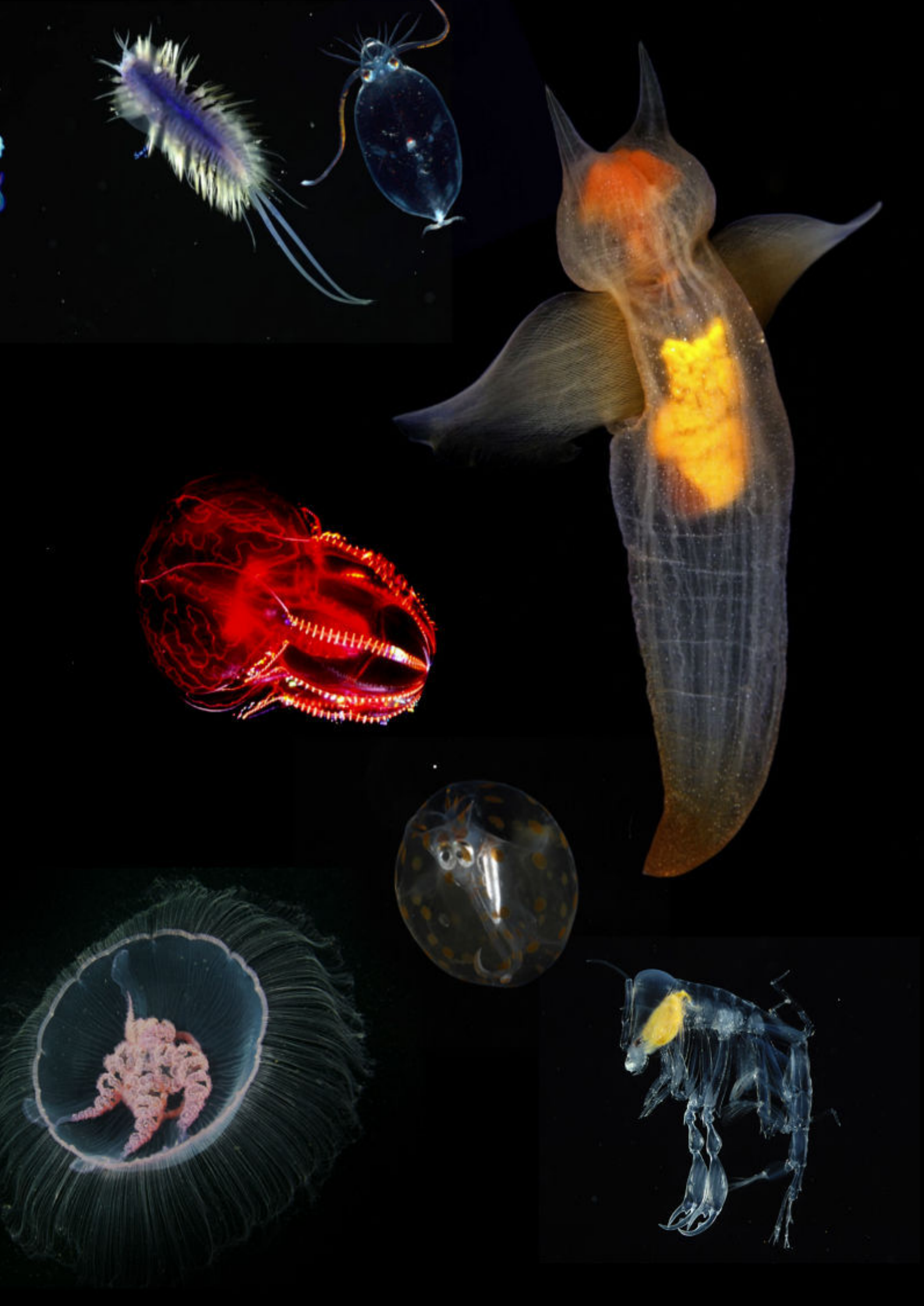


If NASA were to show the world some footage of these creatures and told the world that they were discovered deep inside the Europa's icy crust, a moon of Jupiter (another world), I bet people would pay so much attention to the footage, analyzing it second by second and being amazed by what they see. Yet, the creatures you see in those pictures exist deep within Earth's oceans, so not many are impressed by that.

This is just another demonstration that what makes someone curious, or to feel in awe, is culturally bounded. In today's world, you have to learn to be amazed by the Earth's creatures, and you can only do that by exposing yourself to environments that showcase reality, instead of the shallow values that so many absorb through movies, reality shows, or even everyday life.

It's not only the wonder and the satisfaction of curiosity that is harnessed by looking at Earth's varied creatures. As we have shown, technology and science have always been inspired by creatures and continue to be. In doing so, we may discover better healing methods, build faster trains, develop new treatments and materials, learn how to be more sustainable, prolong our life and better understand what we are.

All of this can be inspired/revealed by the trillions of Earth's moving things: the creatures.



EVENTS

What is an event? Maybe it's just a thing that happens, especially one of significance. But significant for what or for whom? From what goes on inside your guts to events that happen over a period of millions or billions of years, how 'on Earth' can we present some of the most important events? It's hard, but we will do our best to show you some interesting ones.

SHAPES AND VIBRATIONS:

Take rain, for instance. When it rains, many people take their umbrellas with them when they go outside, and for most people, a rainy day is a lousy one. But what many may not realize is that this event is unique to Earth. Aliens from far away planets may not be able to even imagine experiencing such an event. The only other world we know where it 'rains', similar to Earth, is one of Saturn's moons, Titan. It does not rain water there, however, but liquid methane. Thus, on Titan, there are methane lakes and rivers, methane clouds and rain and, who knows, maybe even some kinds of creatures living in this methane-rich environment.

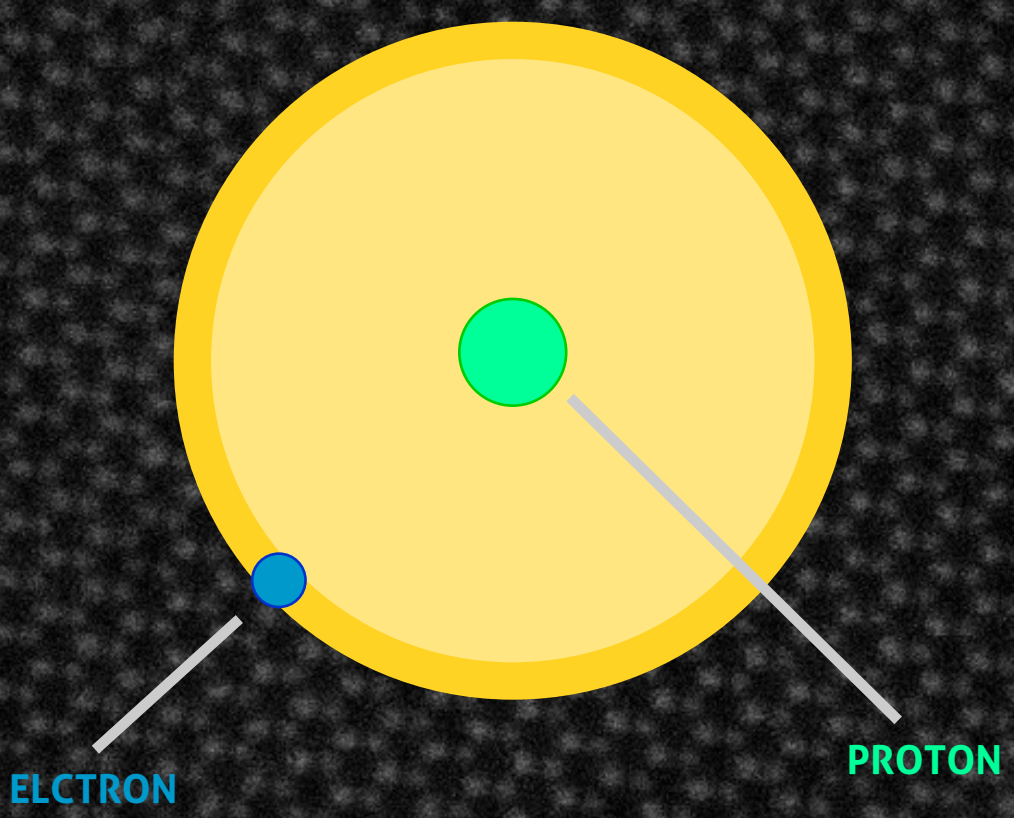
Back on Earth, in order for us to experience this 'mundane' thing such as rain, a huge amount of unique events must occur: from the Earth's position relative to the Sun and the Moon, to the many creatures on Earth and the landscapes found on this planet, and its overall temperature.

I heard many times in school how water evaporates, forms clouds, and then rains back down, but that explanation is overly simplified, as many may not realize that it's all due to structures and vibrations. We will try to explain this phenomena first, in a way that is far more explanatory. Then we'll will build upon that and show you some interesting facts behind any kind of 'event'.

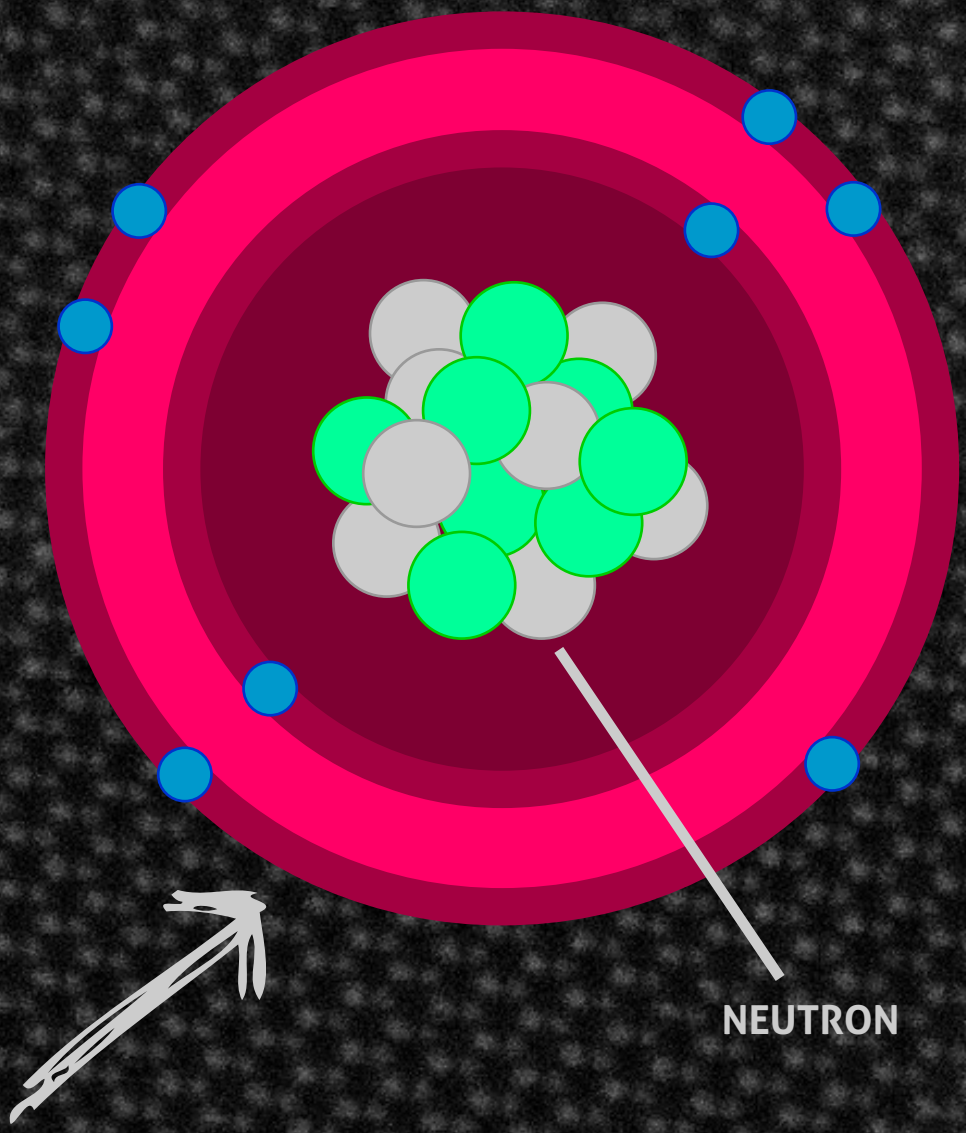
Water: rivers, oceans, snow, rain, ice, vapor, the liquid in your water cup, or in your body. We call all of these 'things' water, because everything in this world is composed of atoms, unique combinations of atoms form molecules, and molecules form the 'stuff' that we see (matter).

Atoms are very, very small 'objects' that are basically composed of 2 main parts: a center and something orbiting that center. It is similar to a solar system in a way. In the center, there are 2 important parts, a neutron and proton. For this article's purpose, we do not need to go deeper into what these protons and neutrons are, but keep in mind that the number of those 2 things in the core, and the number of things that orbit around them (electrons), create the different types of atoms that we know.

In one particular case, there is only 1 proton (no neutrons) and 1 electron. Its very simple structure is the most abundant element in the Universe and we call it 'hydrogen'.



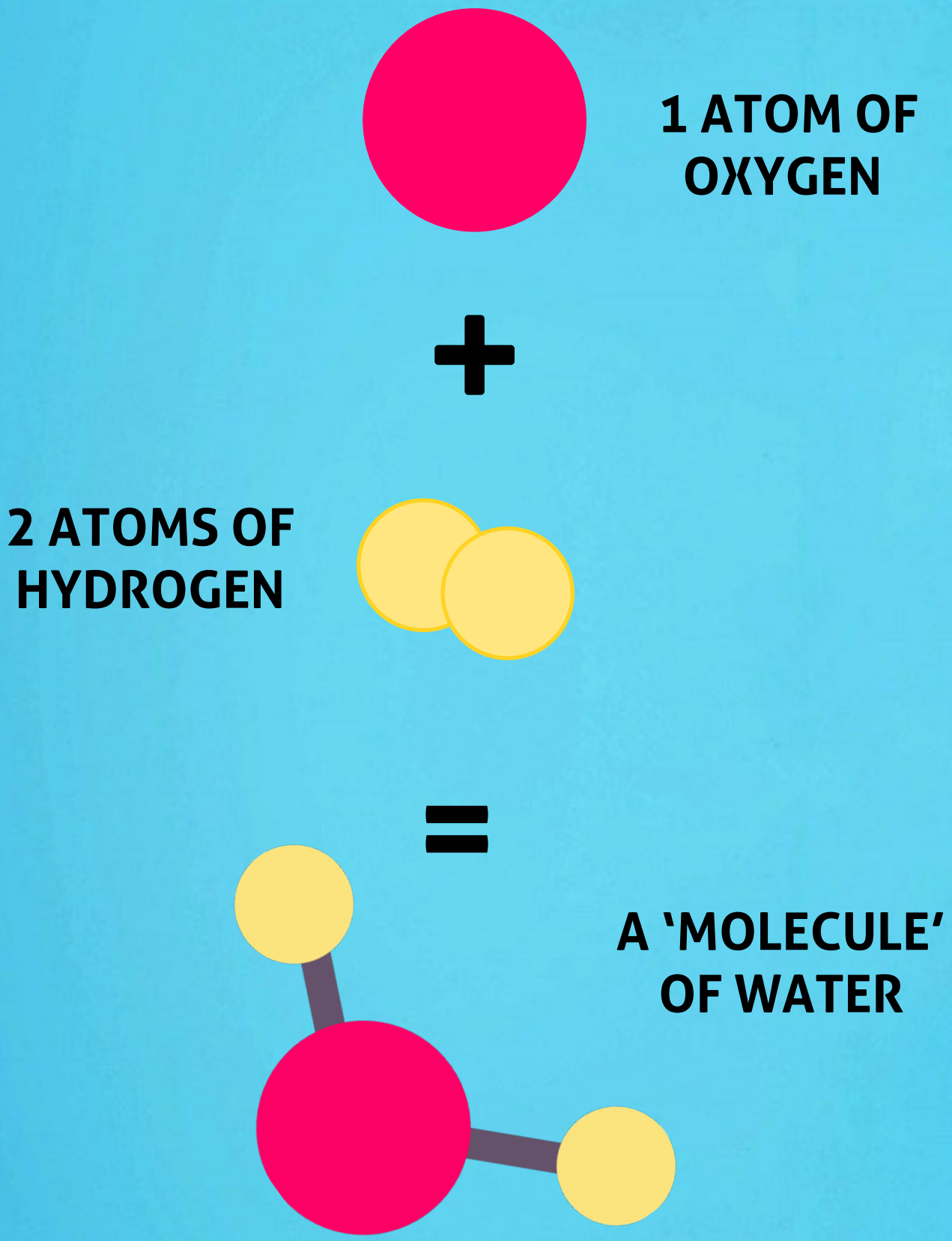
Background Image: This image from a scanning transmission electron microscope shows the individual atoms in a two-dimensional sheet of molybdenum diselenide.



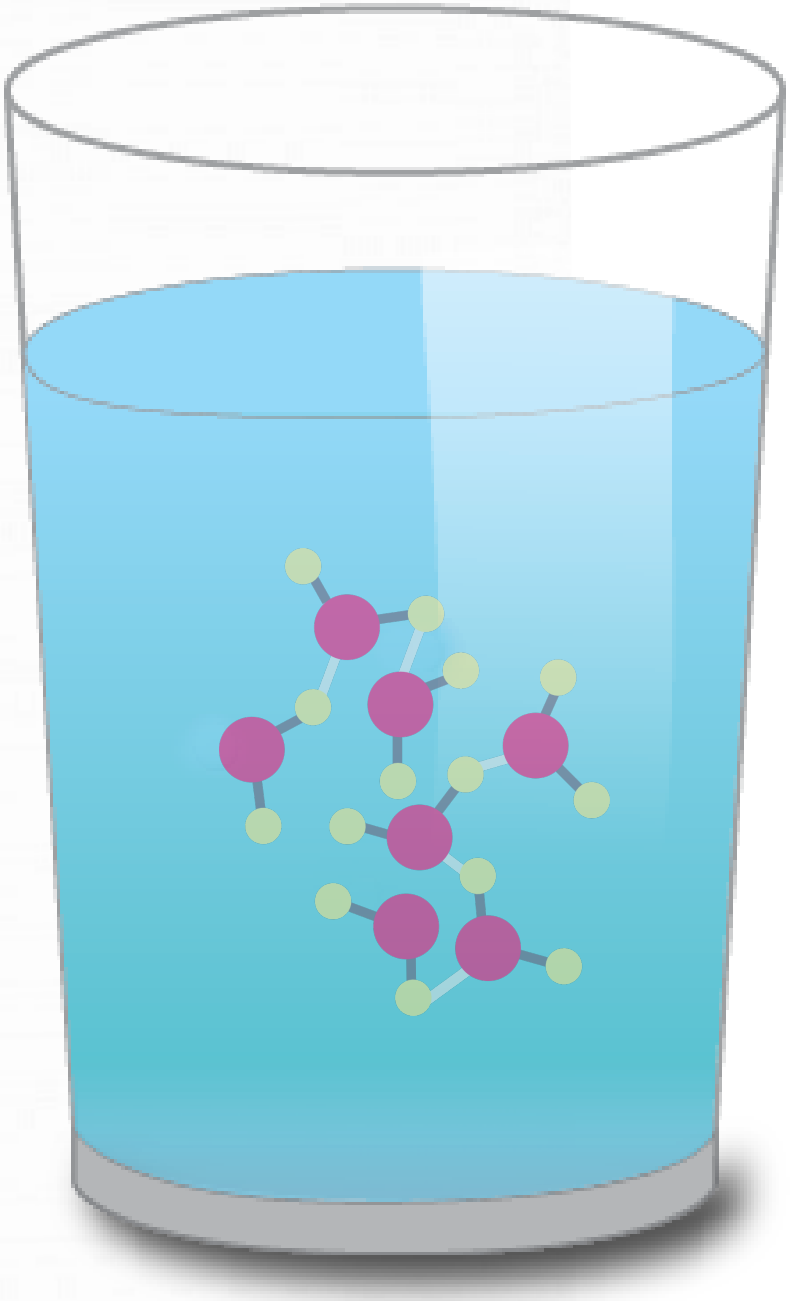
8 protons, 8 neutrons and 8 electrons form another elemental structure that we call 'oxygen'. And so on... Different combinations of these 3 things, protons, neutrons and electrons, create different 'flavors' of atoms.

EVERYTHING WE KNOW

The most mind blowing part of this is the way that these various flavors of atoms combine with each other, creating all the matter in the universe: mountains, guts, saliva, salt, legs, clouds, cells, chairs, rocks, mustaches, laptops... They are like lego pieces with the way they assemble, creating different molecular structures with different properties.



Thus, basically 2 types of atoms 'combine forces' to create the water molecule. Now, imagine this molecule, and multiply it by a trillion, or a quadrillion, and you get the water that we know. They are basically tiny structures that, in bulk, we interpret (see and feel) as one thing, water in this



INDEED THERE ARE MORE WATER MOLECULES IN A SINGLE GLASS OF WATER THAN THERE ARE GLASSFULS OF WATER IN THE ENTIRE OCEAN.(SOURCE)

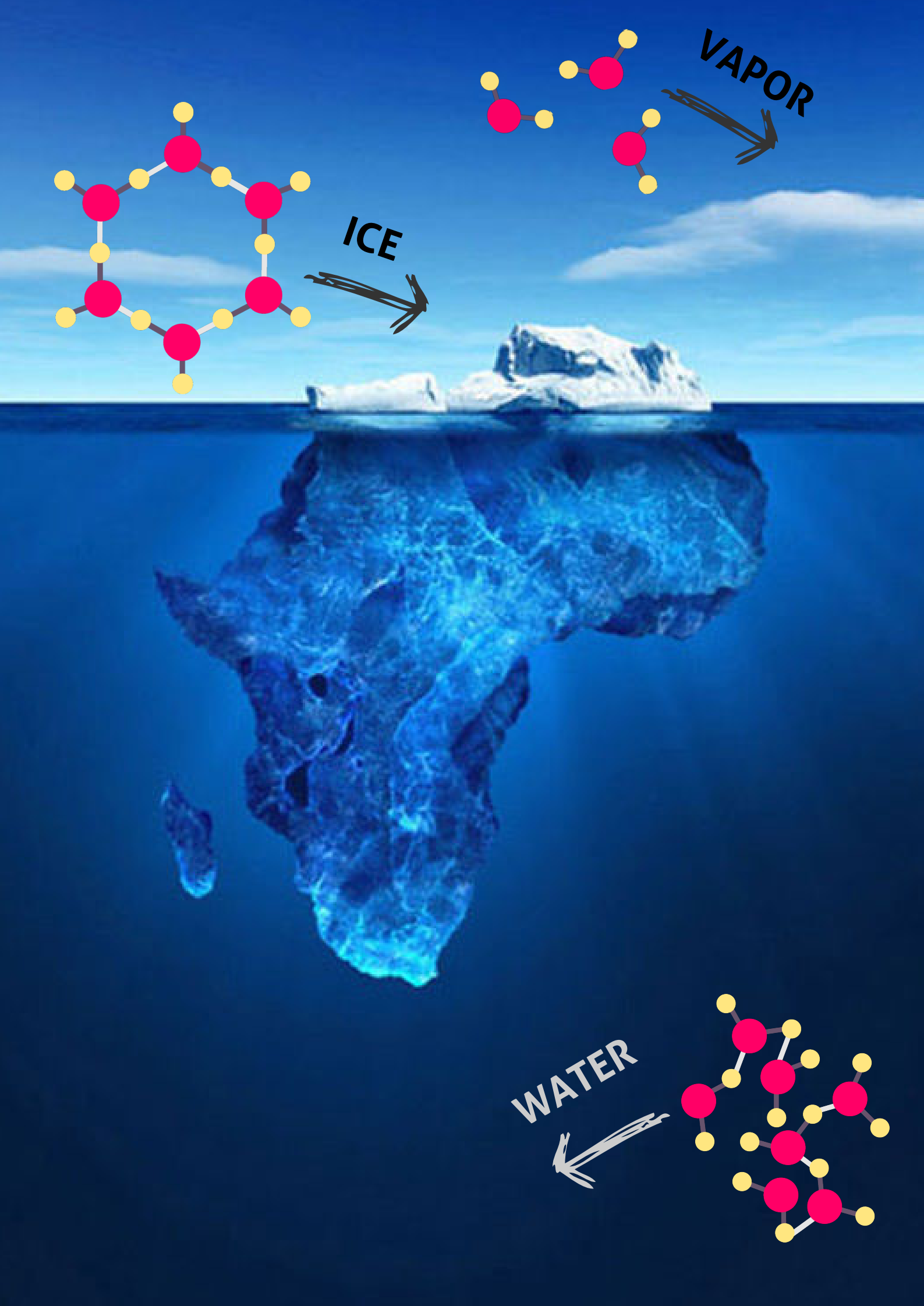
THINK ABOUT THAT!

So how can the same molecule be the building block of ice, water, or steam, when they all look and feel so different to us?

Not only is it mind blowing that that the world we know is basically formed of microscopic 'lego pieces', that assemble into different forms to create everything we know, but it's also really fascinating the way that these lego pieces vibrate to give different properties to the things we know. If water molecules vibrate within a certain range of frequencies, they form liquid water as they keep a somewhat loose bond between them (they are connected, but not very tightly). As their vibration slows down, they become more structured and form what we tend to call 'ice' (their bond is much stronger).

On the other hand, if they vibrate a lot, the bonds between these molecules of water break down and the molecules remain mainly 'alone'. Because individual molecules of water are lighter than the air around them, they rise up and we call that 'water vapor'.

To understand this better, when you boil water, you are transferring energy to the water molecules. They eventually vibrate so much that many of them start to lose their bonds and become individual molecules, which we then see as vapor rising out of the pot. I hope you get the picture, as it is all about this 'vibration'.


VAPOR
ICE
WATER

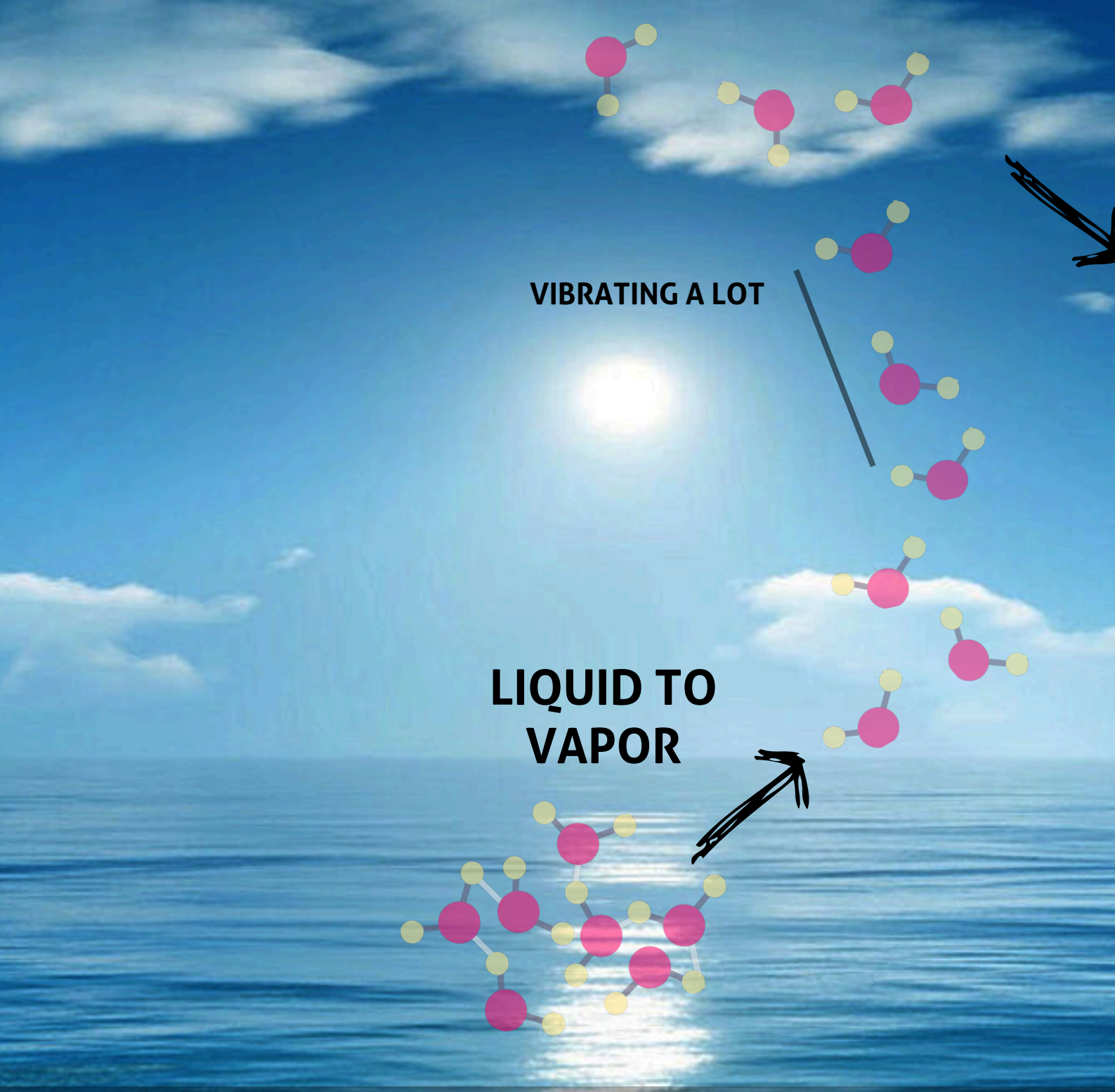
In fact, there is no such thing as 'cold'. There are only vibrations of atoms and molecules (we interpret less vibrations as cold, and more vibrations as 'hot').

When you go outside and feel cold, what happens is that the atoms from your own body interact with the atoms/molecules from outside, and those from outside vibrate less (that's why is colder), thus your atoms and molecules become more in sync with the outside ones, and the loss of vibration of your body's molecules feels 'cold' to you.

When you touch a hot piece of metal and feel heat (burned), the faster vibrating state of the atoms that make up that metal quickly transfer to the atoms of your own hand and they begin to vibrate in the same way as the atoms from the hot metal.

This is why if you hit a metal bar with a hammer, both will get 'hotter', simply because you are 'agitating' the molecules of both of them. What you feel, in common terms of 'hot' or 'cold', is just an exchange of vibrations between your atoms and molecules, and other atoms and molecules.

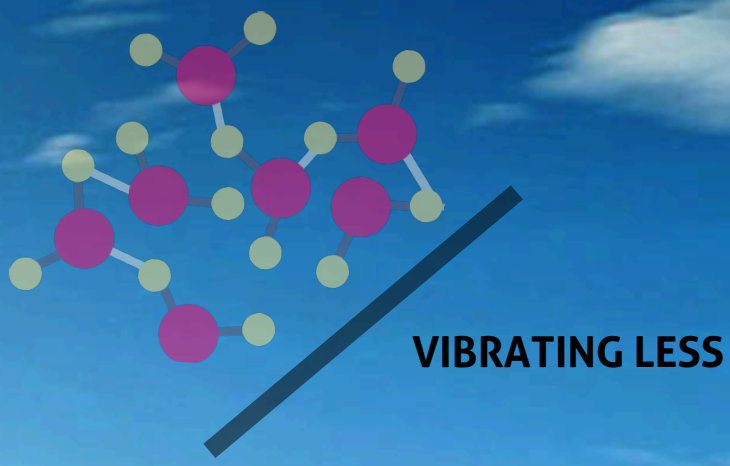

OUTSIDE ATOMS
HUMAN ATOMS



With all of that in mind: when the Sun's rays or any other kind of heat source (energy) transfers into water, it makes the water molecules vibrate more and more, eventually losing their bonds and rising up into the atmosphere. This is how clouds are formed.

These molecules then react to the colder environment up there and start to vibrate less, thus allowing new bonds to form between them. As millions of such bonds happen around the same place, a rain drop begins to form, and once that raindrop becomes heavy enough, it falls back to the Earth due to gravity.

VAPOR TO LIQUID



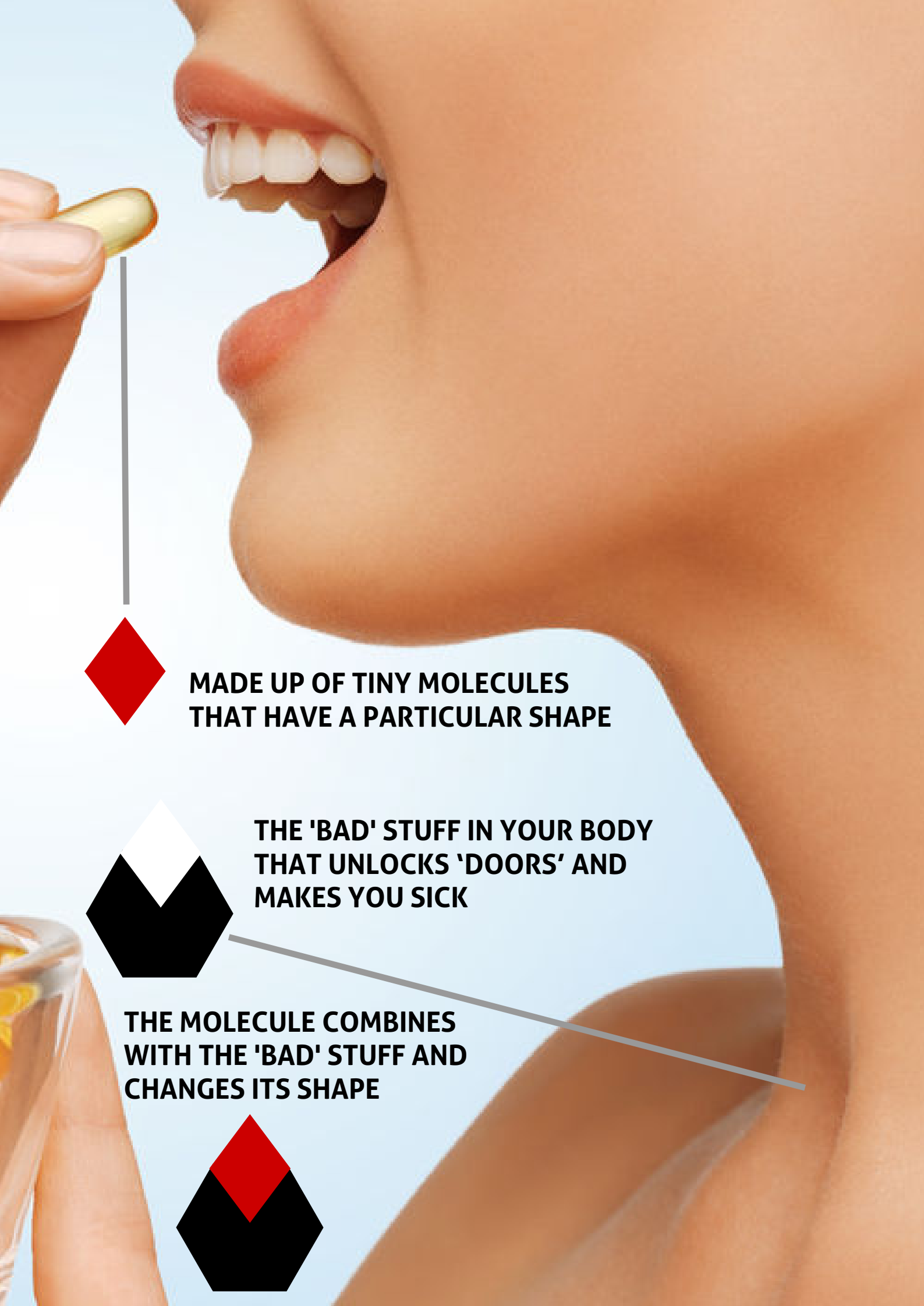
Thus, the difference between liquid water, ice and vapor is all in how strong (if at all) the water molecules bond with each other, and this bond is dependent of the vibration state of the molecules.(source)

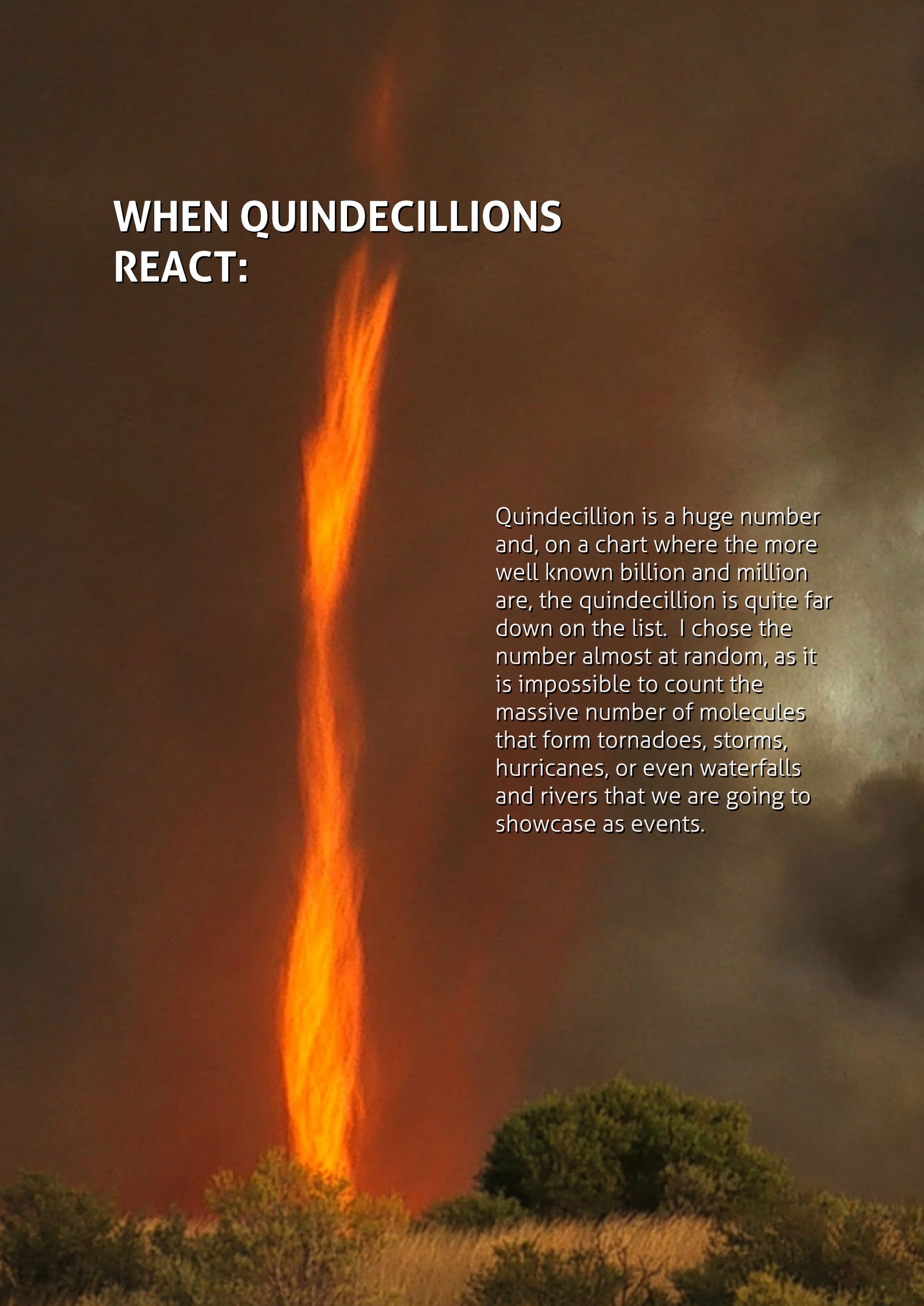
The seasons that we experience here on Earth are basically a bunch of these tiny reactions of the lego-like atoms and molecules that bind and vibrate, while the 'rhythms' and shapes of their interactions create not only events here on Earth, but throughout the entire known universe.

The shape of things, especially molecules, is so important that even when you take medicine, you are basically ingesting specific molecular forms (atoms clustered together in a particular way) that are specifically designed (shaped) to merge/ combine with other 'things' in your body, just like lego pieces.

The 'bad' stuff in your body (viruses, unhealthy bacteria, etc.) are basically like keys that can open 'doors' in your body and trigger harmful effects for you, while medicines are basically specifically designed shapes (molecules of atoms) that will bond to these keys, making them no longer able to access those 'doors'.

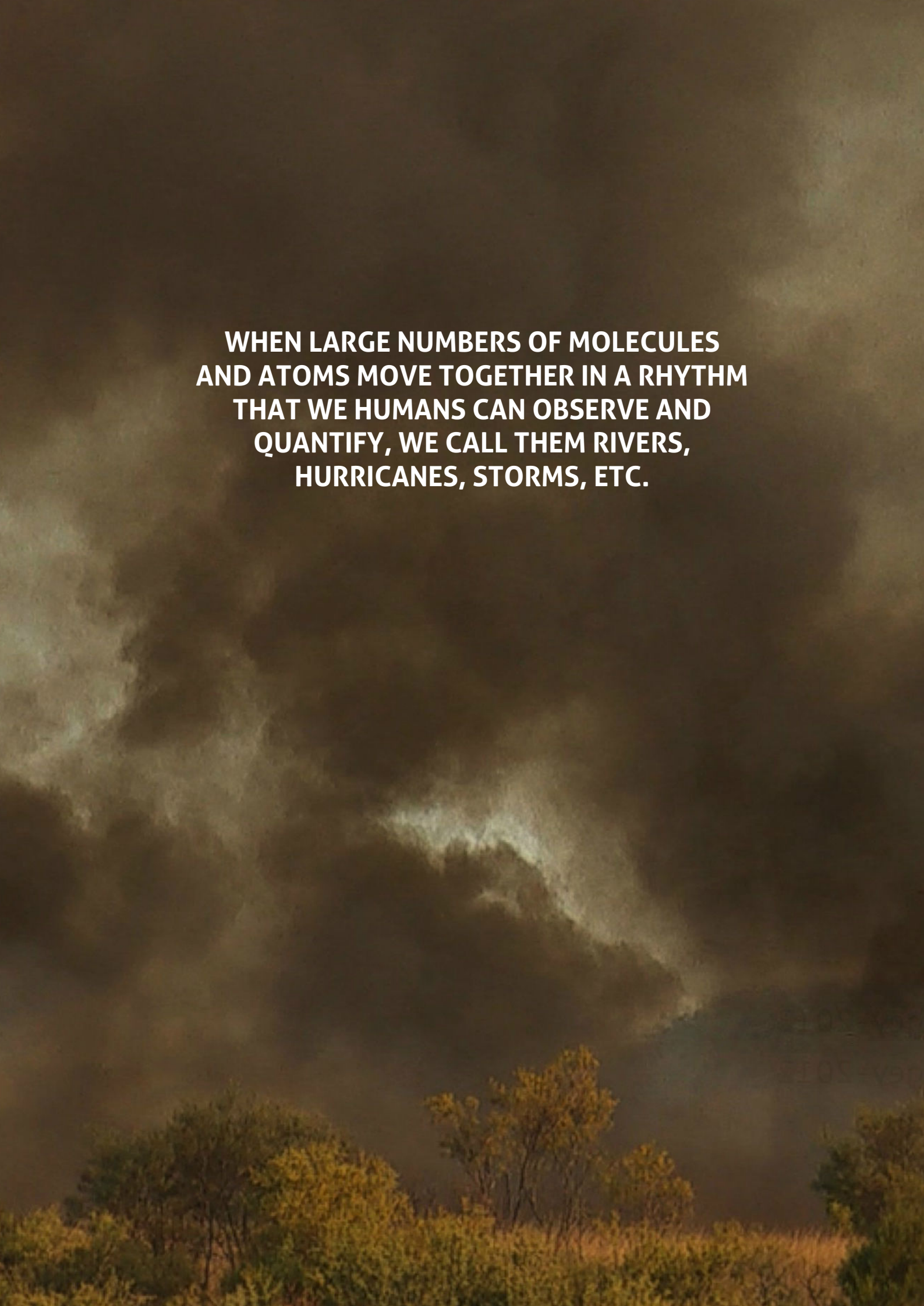
ISN'T IT FASCINATING THAT IT'S ALL ABOUT SHAPES AND VIBRATIONS?


MADE UP OF TINY MOLECULES THAT HAVE A PARTICULAR SHAPE
THE 'BAD' STUFF IN YOUR BODY THAT UNLOCKS 'DOORS' AND MAKES YOU SICK
THE MOLECULE COMBINES WITH THE 'BAD' STUFF AND CHANGES ITS SHAPE



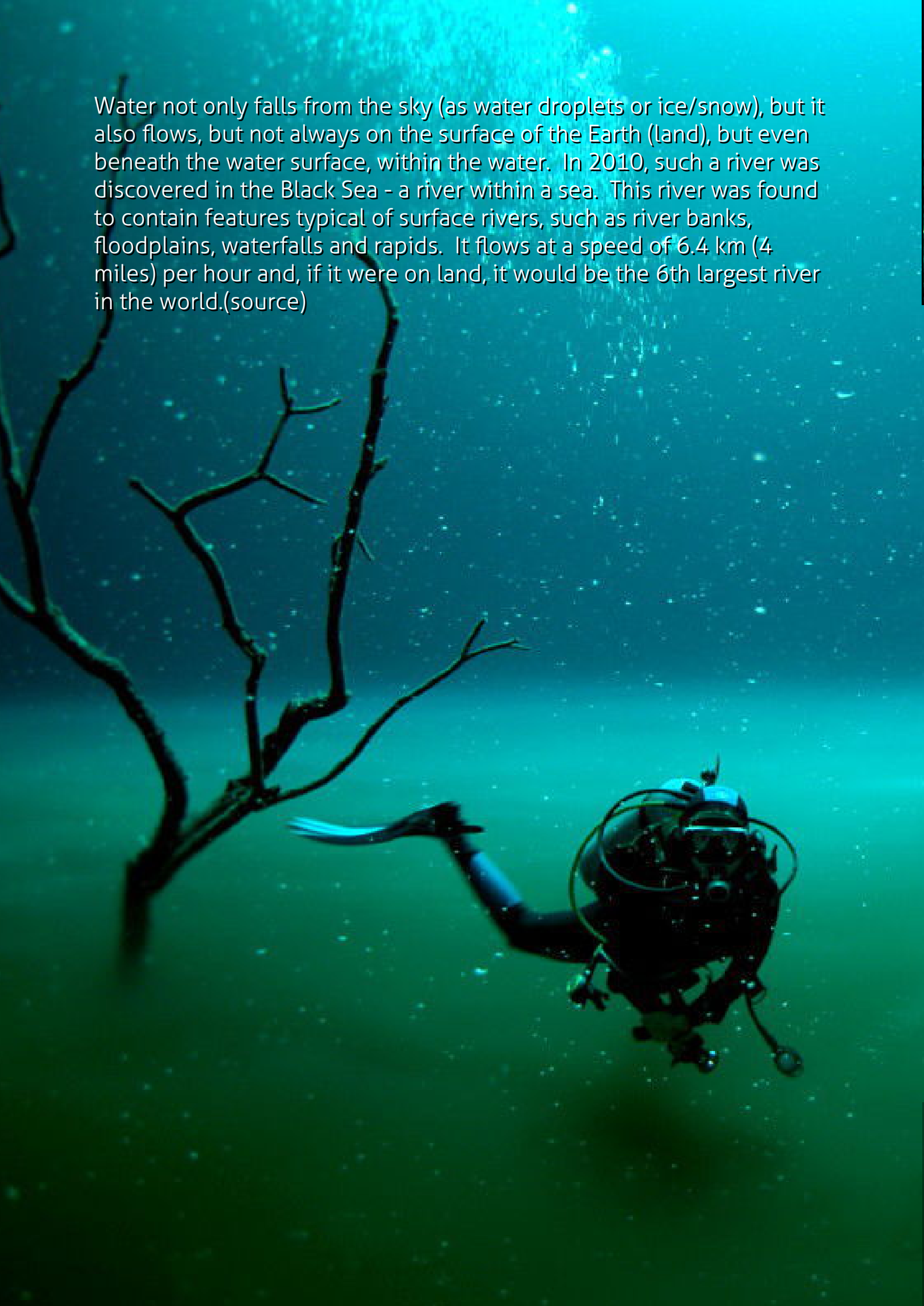
WHEN QUINDECILLIONS REACT:

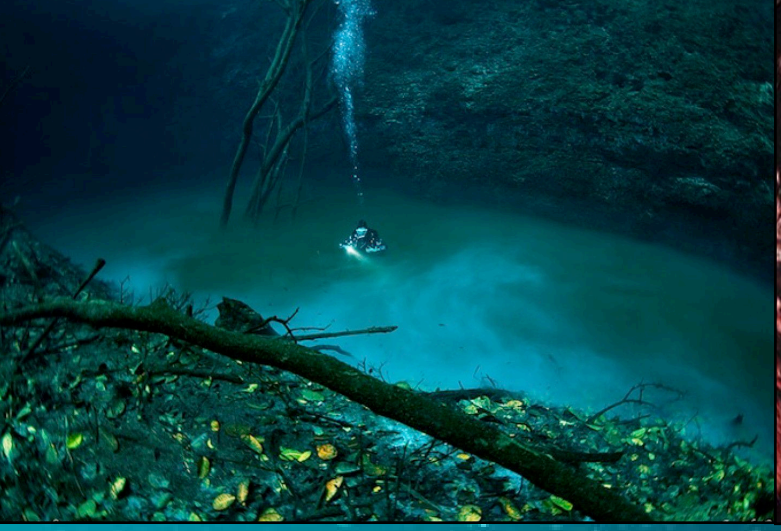
Quindecillion is a huge number and, on a chart where the more well known billion and million are, the quindecillion is quite far down on the list. I chose the number almost at random, as it is impossible to count the massive number of molecules that form tornadoes, storms, hurricanes, or even waterfalls and rivers that we are going to showcase as events.



WHEN LARGE NUMBERS OF MOLECULES AND ATOMS MOVE TOGETHER IN A RHYTHM THAT WE HUMANS CAN OBSERVE AND QUANTIFY, WE CALL THEM RIVERS, HURRICANES, STORMS, ETC.

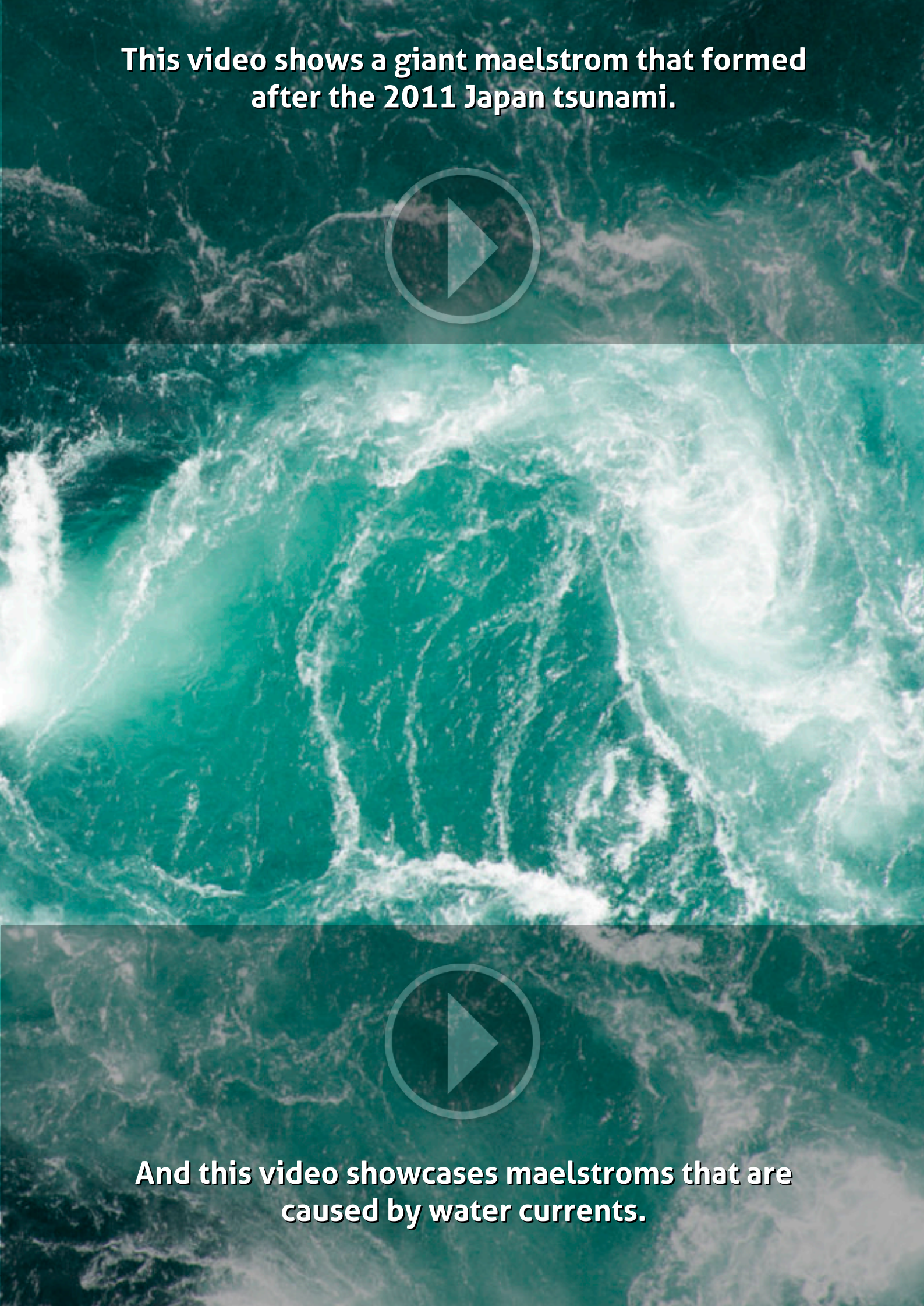
Water not only falls from the sky (as water droplets or ice/snow), but it also flows, but not always on the surface of the Earth (land), but even beneath the water surface, within the water. In 2010, such a river was discovered in the Black Sea - a river within a sea. This river was found to contain features typical of surface rivers, such as river banks, floodplains, waterfalls and rapids. It flows at a speed of 6.4 km (4 miles) per hour and, if it were on land, it would be the 6th largest river in the world.(source)





Photos: Cenote Angelita - A similar underwater river, or 'water current'

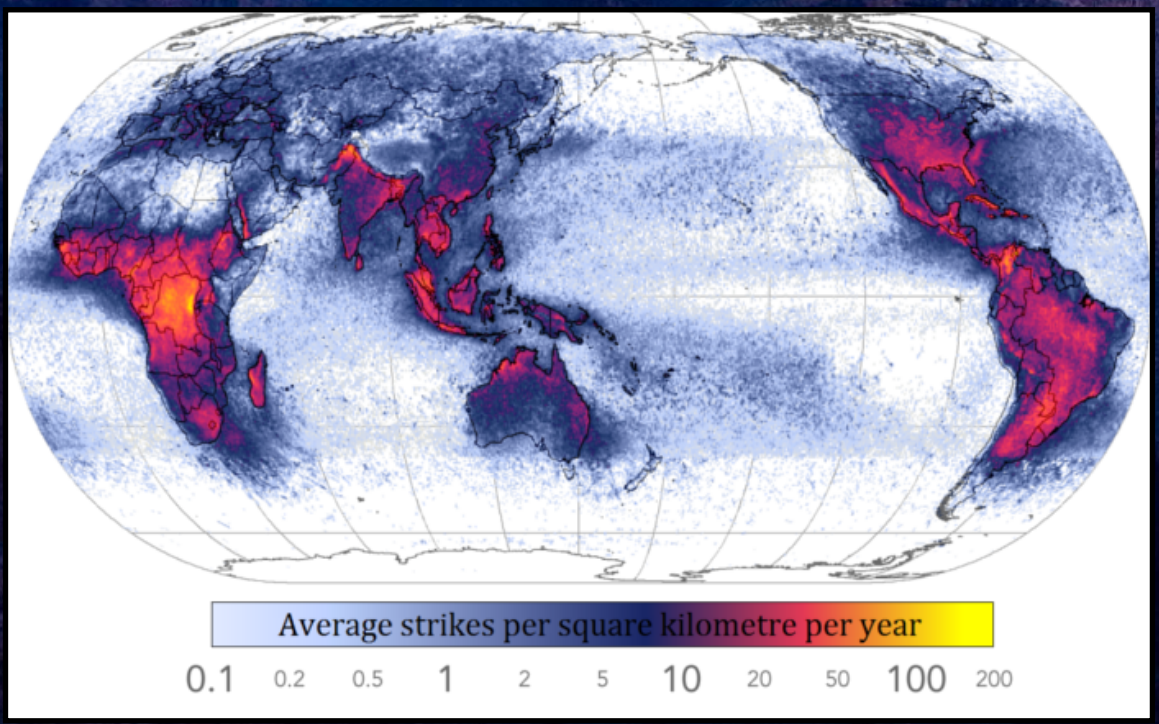
Vortexes, like tornadoes or hurricanes, do not only happen on land, but as in the case of the underwater river, they happen beneath the water as well. A maelstrom is a powerful vortex that is created by water currents, tsunamis or sinkholes.


This video shows a giant maelstrom that formed after the 2011 Japan tsunami.
And this video showcases maelstroms that are caused by water currents.

A storm can also be dry - made out of dust and/or sand. These storms can grow up to 1.6 km (0.99 miles) high; so massive that they can be seen from space. Dust storms are essential for rainforests like the Amazon in delivering nutrients. Just imagine that dust from Sahara travels all the way to the Amazon forest.(source)

Also, the effects of a storm on the surface of the Sun can be experienced here on Earth, when the storm's wind (the solar wind) reaches us. Tiny particles (mainly protons and electrons) interact with the Earth's atmosphere and create (for us) surreal lights in the sky.(source)

Sometimes within 'normal' storms, dust storms, forest fires, tornadoes, or volcanic eruptions, the quindecillion of tiny particles get 'overcharged' by friction and produce what we see as lightning. On average, 40-50 lightning events happen every second around the planet's surface. However the strikes are not equally distributed, as seen on this map.

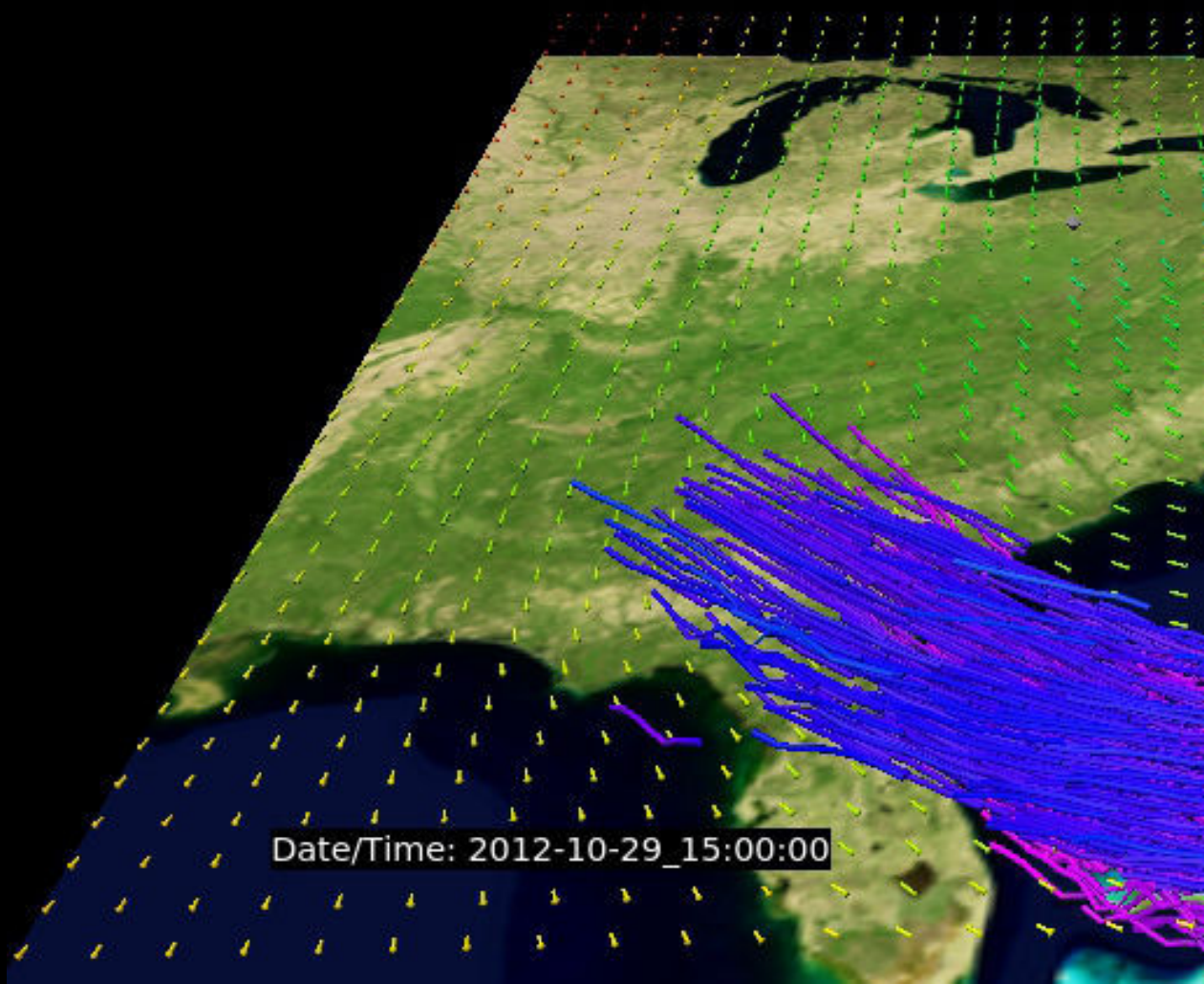


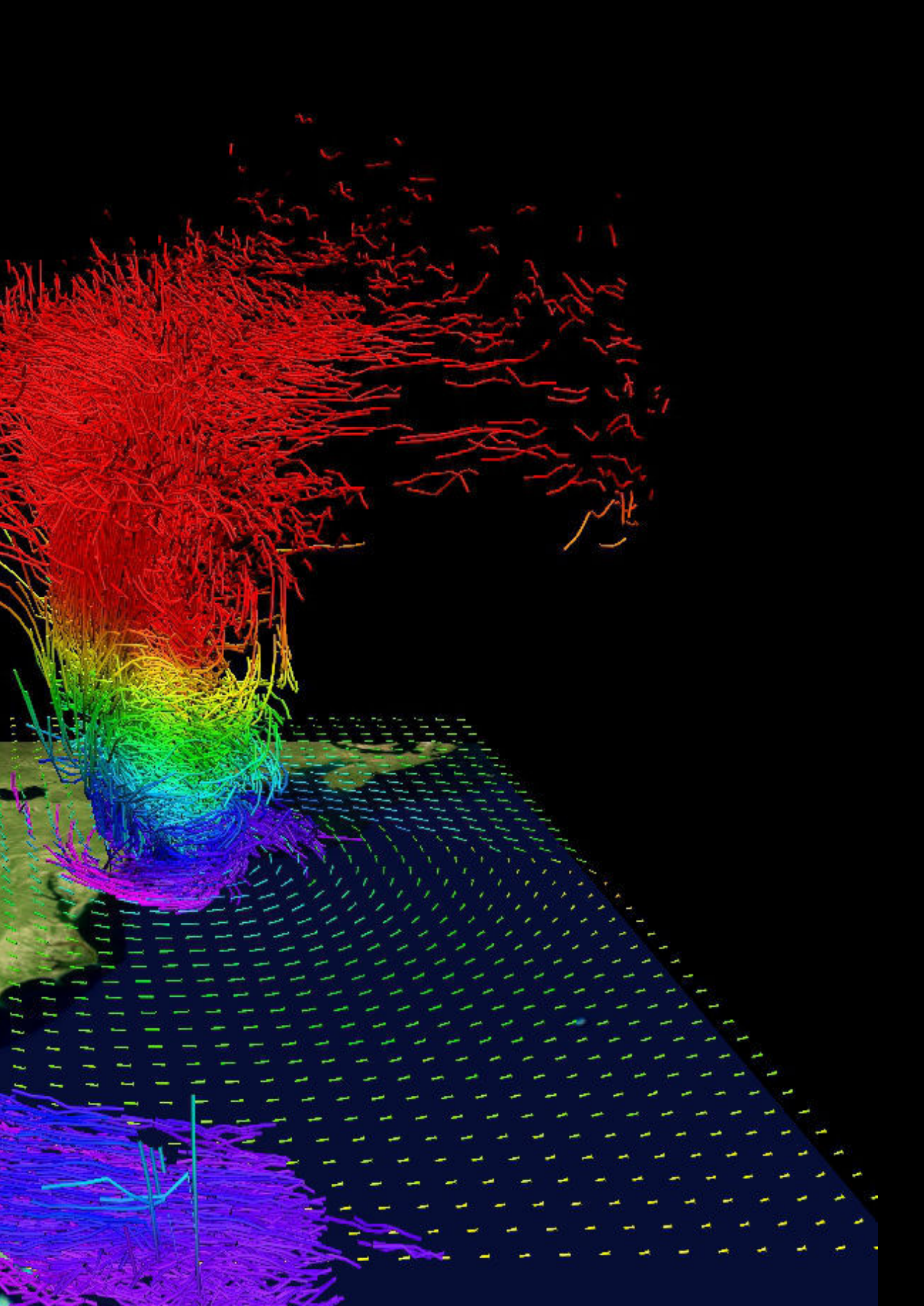
Lightning is 5 times hotter than the surface of the Sun and, 'ironically' in a way, it's ultimately powered by the Sun's energy, as the Sun provides energy to the Earth (it makes the Earth's atoms and molecules vibrate).(source 1, 2)

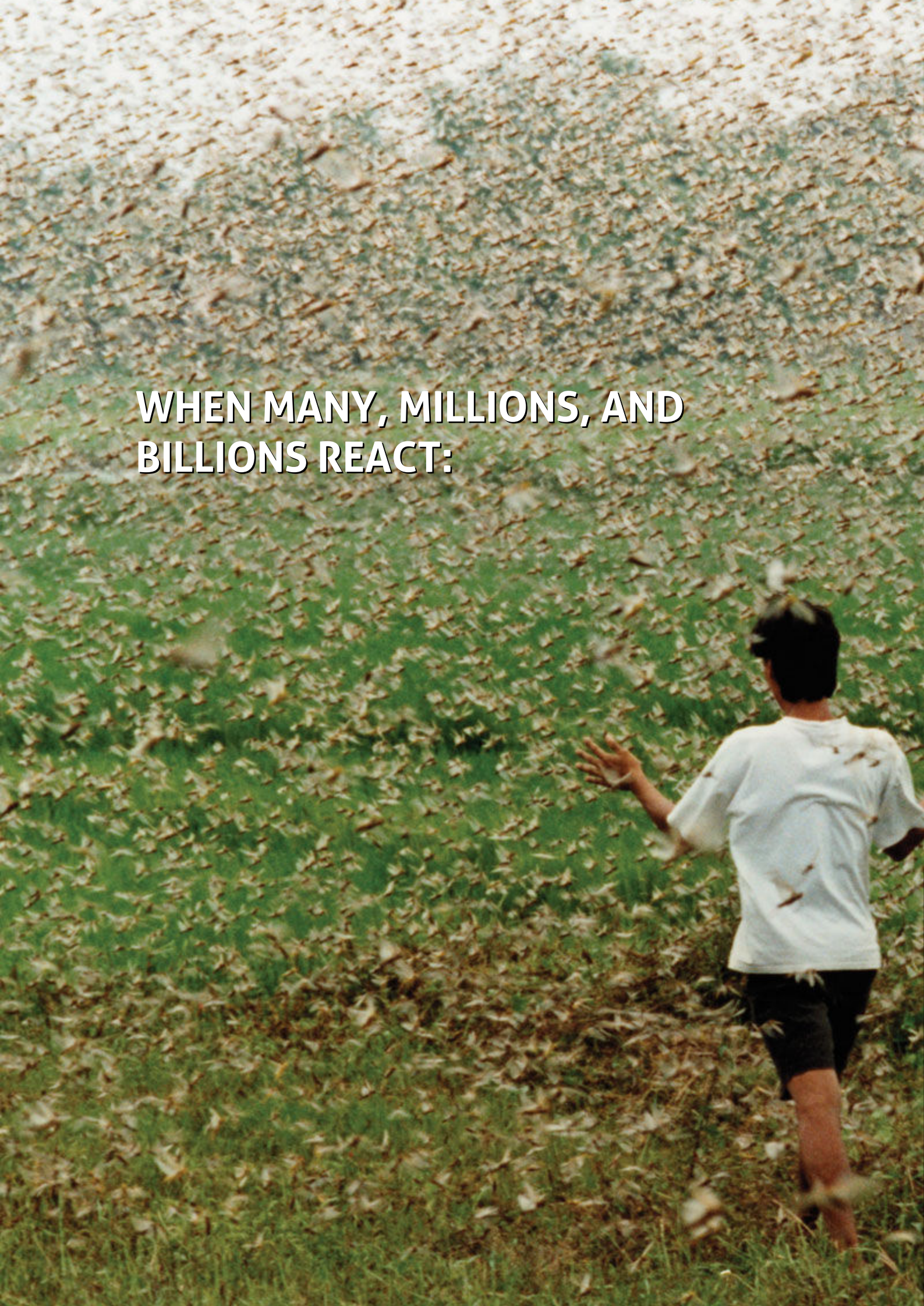
But lightning also has multiple types. There can be downward strikes, horizontal strikes, upward strikes, and even electrical discharges in the form of a sphere, such a rare phenomenon that the first and only video capturing such a strike was recorded by mistake in 2012. This 'lightning ball' was 5 meters (16.4 feet) wide and traveled 15 meters (50 feet) horizontally in 1.5 seconds.(source)

Understanding quindecillions of reactions requires the most powerful computers on Earth, as the reactions are so dynamic and innumerable that it seems impossible to ever understand, with great precision, the events they create.

However, humans are continually understanding more and more of these phenomenons created by the tiniest of things on Earth, thus allowing science to, for example, better predict weather, while pushing the incentive for building better equipment for detection and prevention, coupled with the need to develop greater and greater computational power.







WHEN MANY, MILLIONS, AND BILLIONS REACT:

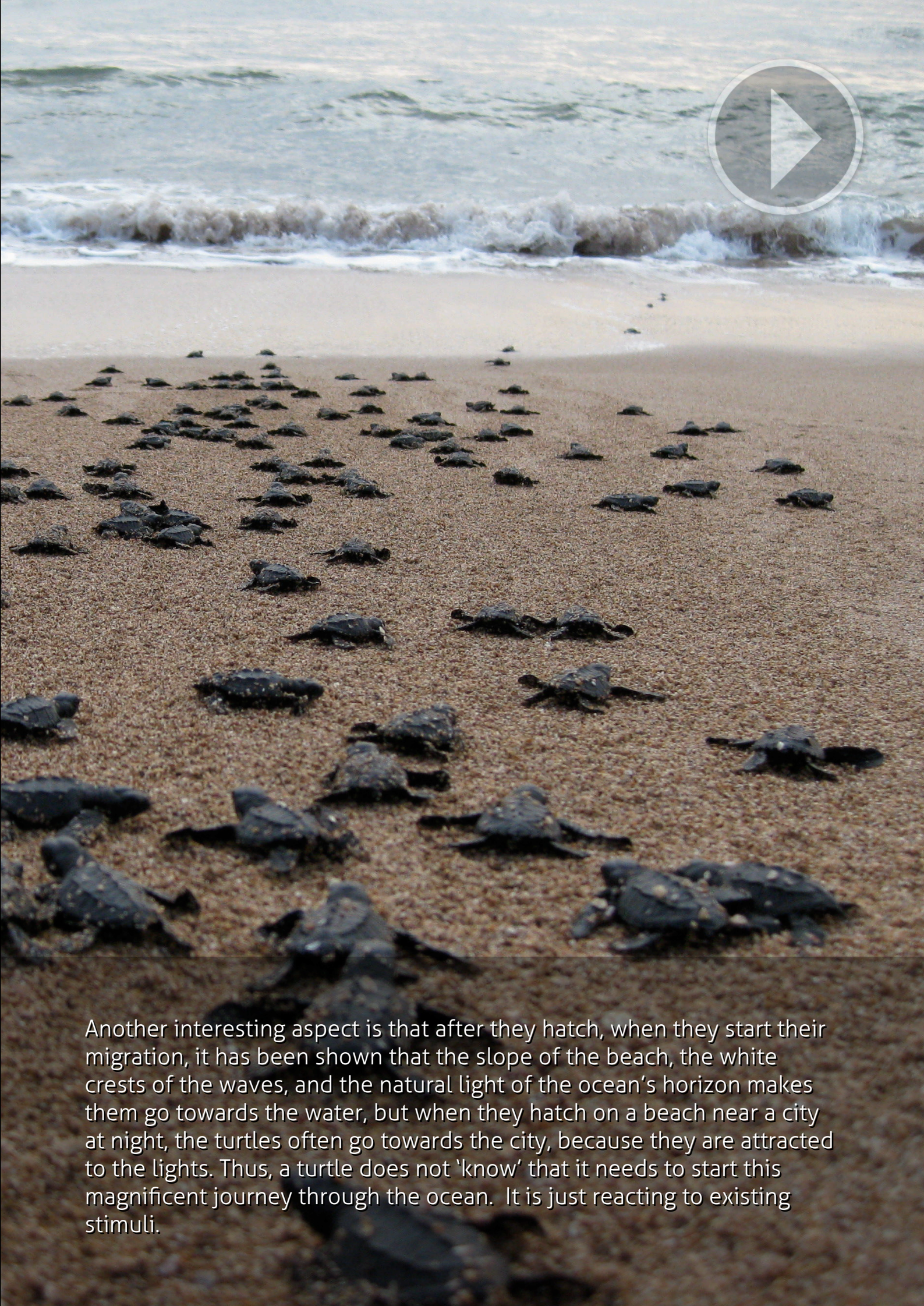
From those tiny atoms and molecules, we'll now migrate to large creatures and some of the most amazing of their total-environment responses. When it comes to mass migrations of creatures, one word has been used to describe these events more than any other: instinct.

Unfortunately, the word instinct tells you nothing about the mechanisms behind these migrations. It needs to be understood that when it comes to such migrations, they are the result of many series of events and environmental reactions that make it extremely hard to properly understand them. That is not to say that we should use a word without meaning to replace the unknown, but rather to seek more complete understanding.

This is a living sphere of sardines. Banks of sardines can grow up to 7 km (4.3 miles) long, 1.5 km (0.8 miles) wide and 30 metres (98 feet) deep. Billions of them take months to migrate over 1000 km (620 miles), every year, driven, it seems, by the water's temperature, in what results in the greatest 'feast' on the planet.

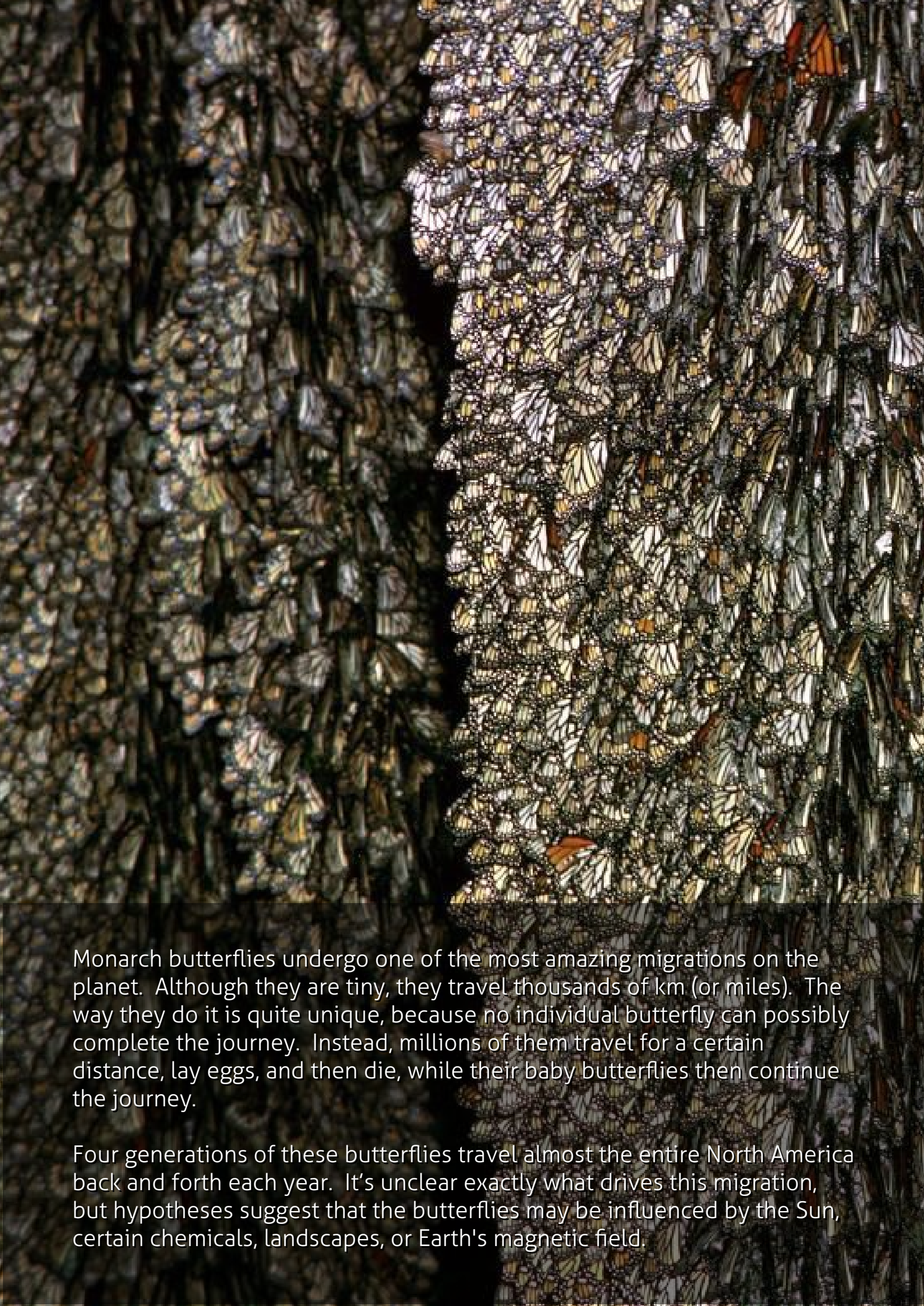
Due to the presence of billions of sardines in one place, thousands of dolphins, hundreds of sharks, many whales and seals, and even birds flocking to enter the water like rockets from the sky, all converge in a creature feeding frenzy.(source)

Sea turtles annually migrate for hundreds or thousands of km/miles and eventually return to the same location where they were born to lay their eggs, which is amazing. It is thought that the Earth's magnetic field helps the turtles return to the same place where they started as 'babies'.



Another interesting aspect is that after they hatch, when they start their migration, it has been shown that the slope of the beach, the white crests of the waves, and the natural light of the ocean's horizon makes them go towards the water, but when they hatch on a beach near a city at night, the turtles often go towards the city, because they are attracted to the lights. Thus, a turtle does not 'know' that it needs to start this magnificent journey through the ocean. It is just reacting to existing stimuli.

Humpback whales migrate over half of the circumference of the Earth (25 000 km - or around 15 500 miles), each year, influenced by climate changes, water temperature, oceanic depth, salinity, topography of the seafloor, and the biggest one, abundance of food. Their speed is around 4.8 km (3 miles) per hour, so imagine yourself, traveling more than half the globe, on foot, every year.

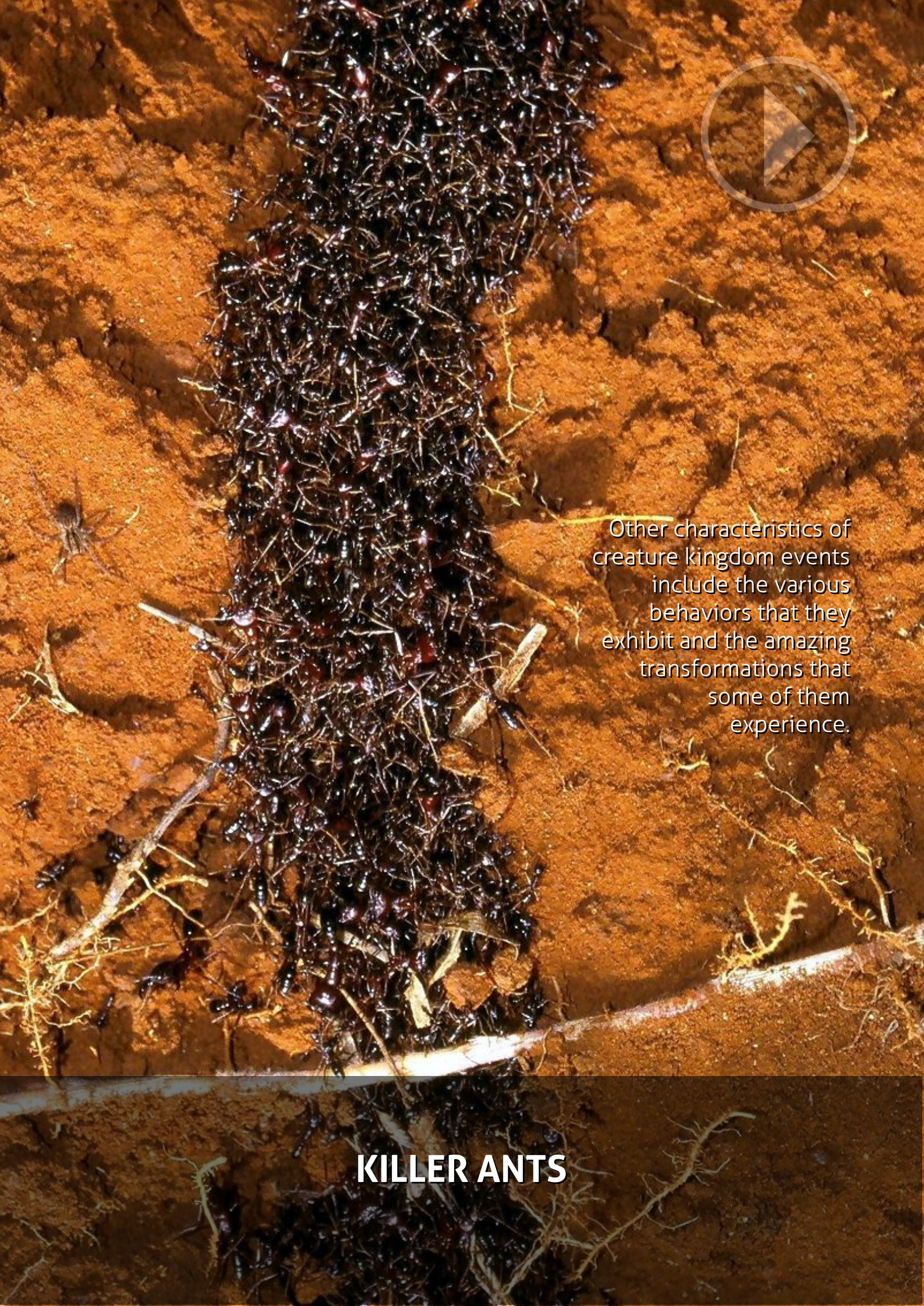


Monarch butterflies undergo one of the most amazing migrations on the planet. Although they are tiny, they travel thousands of km (or miles). The way they do it is quite unique, because no individual butterfly can possibly complete the journey. Instead, millions of them travel for a certain distance, lay eggs, and then die, while their baby butterflies then continue the journey.

Four generations of these butterflies travel almost the entire North America back and forth each year. It’s unclear exactly what drives this migration, but hypotheses suggest that the butterflies may be influenced by the Sun, certain chemicals, landscapes, or Earth's magnetic field.

From insects to wildebeests, enormous migrations occur all over the earth, triggered by the tiny particles that create the atmosphere and various scents, dictate temperature, and more.

WILDEBEEST MIGRATION



Other characteristics of creature kingdom events include the various behaviors that they exhibit and the amazing transformations that some of them experience.

KILLER ANTS

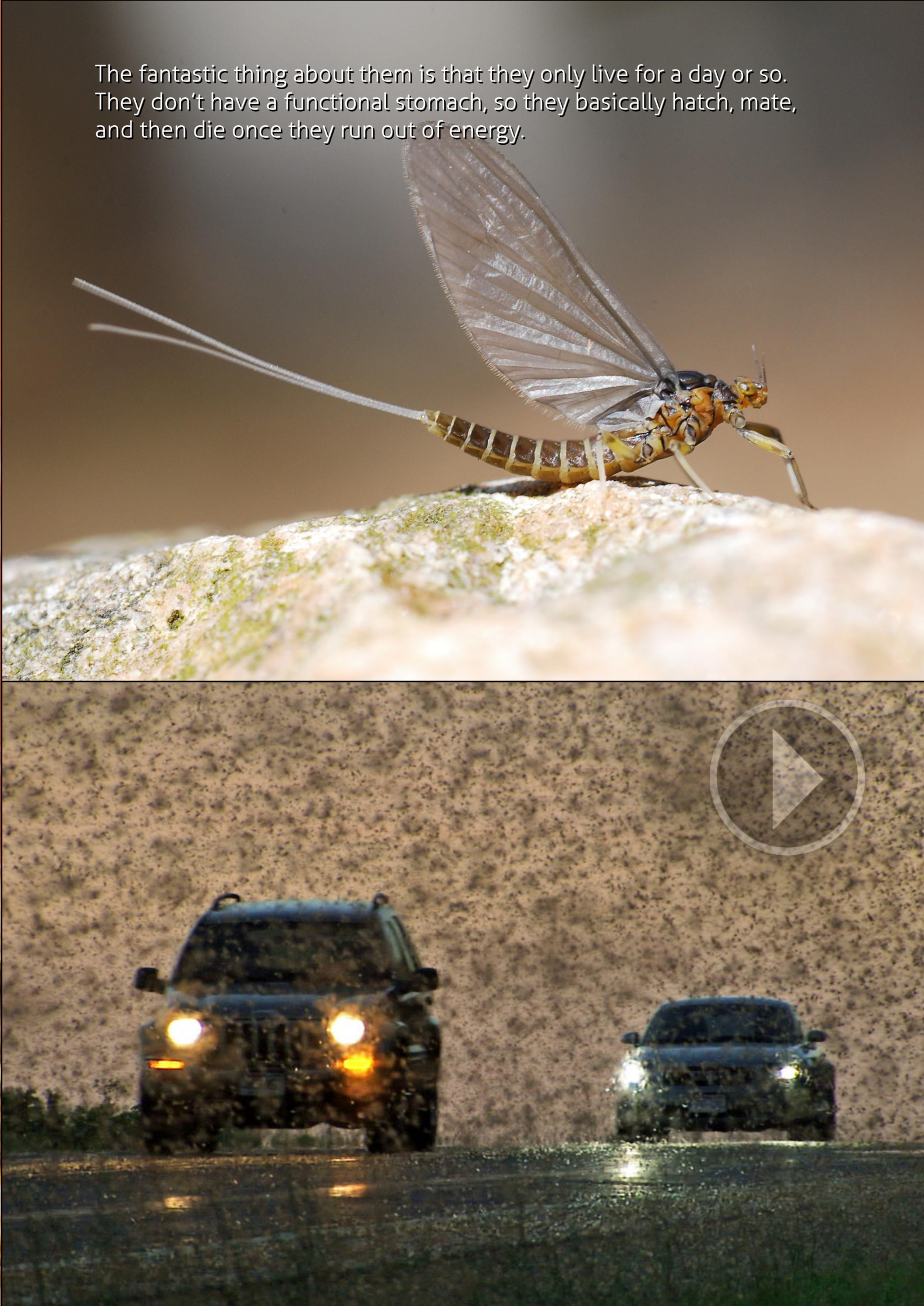
Another migration event, similar to the monarch butterflies, happens with dragonflies, where again, it takes four generations for them to travel across many thousands of km (miles) each year. A very interesting aspect of dragonflies is that most of their life is spent in water, in a fish-like state, where they hunt other creatures using their extendable jaws. Some can even hunt on land.

After five years or so, they emerge from the water, transforming into a flying insect.

One question to consider might be: How can the neurons that act as this creature's 'brain' adapt so readily to such different environments and movements?

Does this look like a fly to you? This bug lives beneath the water and similar to the dragonfly, it transform into a fly after 1-3 years. In fact, billions of such flies emerge from the water almost at once.

The fantastic thing about them is that they only live for a day or so. They don't have a functional stomach, so they basically hatch, mate, and then die once they run out of energy.



EVERYTHING IS ENERGY FLOW:

If you think about that fly, it died because it had no energy. Well, how true is that? If you burn that fly, it will burn, meaning it will emanate energy. Even the dead body of a fly still contains energy potential (almost the same amount as a living one), but just not enough to keep it alive. Once you burn that fly, it does not mean that you have eliminated the energy, but instead have distributed it. Meaning, the atoms that were once that fly, can become part of your food, or atoms of other creatures, or mountains, water, or other planets or stars.

What is amazing about the world we live in is that there is the same amount of energy in the Universe as there was 100 million years ago, or at the beginning of the universe, and it will always remain the same.

When you plug in an electric toy, or run it on batteries, it 'works' because it has an energy source, and thus an energy flow powering its components. The same thing occurs with water movement, storms, butterflies, wildebeests, and indeed, us.

The Sun's rays strike the Earth and plants convert it into chemicals (stored energy). Plants get consumed by animals and provide energy and tissue (again stored energy) for the animal. We then eat both plants and animals to get the energy needed to pedal our bikes up a hill. Thus, that energy moved from the Sun, to the plant, through the animal, into you and then became available to the bike's mechanics. It was essentially dispersed into organic matter, heat and movement (all of them, as the movement of atoms).

SO THAT'S HOW VARIOUS EVENTS TAKE PLACE HERE, ON EARTH, AS WELL AS ANYWHERE IN THE UNIVERSE.

The next time that it rains, you see other creatures, you feel warm or cold, or even just think about yourself, remember that we are all made up of lego-like pieces, through which energy flows and animates. In that sense, we are certainly all one, since, in that sense, we are all energy.

WHY DOES IT MATTER?

When it comes to The Venus Project, why does it matter whether we understand how water changes states between ice, liquid and vapor, how events on planet Earth unfold, or other knowledge of this nature?

The illusion of being knowledgeable:

When I was little, I thought that just because they were the "grown-ups", they knew everything about the world that I was trying to learn. I asked my parents about everything, expecting that they had all the knowledge. The funny thing is that they thought this as well. The culture that most of us live in is structured in a ladder-like-style, where people are made to feel like they are climbing it with every 'step' they graduate: school gradings (1st, 2nd, 8th, 12th, etc.), diplomas, jobs, marriage, children, etc.. This gives people the illusion of associating age (progress in life and career) with being knowledgeable, even 'wise' (whatever that means).

It's not surprising that it leads to a world where people stop learning when they finish school, and stop listening when they become grown-ups. People might think that because one is a doctor (a career associated with 'intelligence'), that person is knowledgeable in all fields.

People often show off their diplomas to showcase how knowledgeable they are, and this is a sign of the illusion that's created in a money-based world where people have 'careers' and hold on 'job-positions'.

But there's more to this. Some years ago, when I posted a documentary about atoms on a personal blog that I had and I was so thrilled by these things called 'atoms' that I projected that excitement in the post's description, a guy commented saying that my excitement was nonsensical, because the information presented in the documentary is known to any 5th grade student. He didn't understand why I was so excited about that documentary.

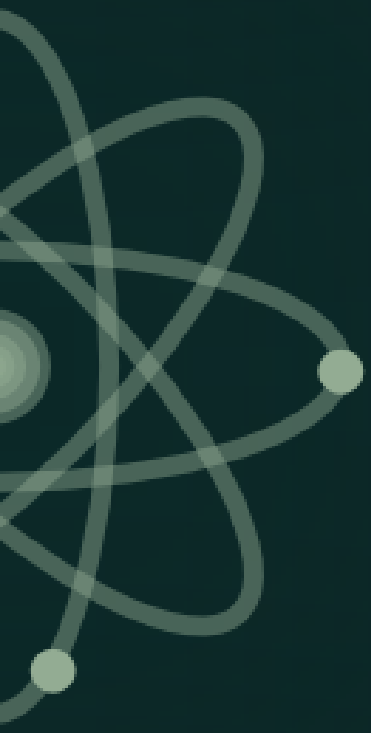
However, I have since learned that familiarity is different from understanding - completely so.

My old chemistry teacher was very religious and never seemed to question the information she taught. She introduced us to atoms (and obviously knew a lot about them), but I am pretty sure that she never understood that these atoms she was describing were real.

More to the point, because she knew enough to teach about atoms but didn't really understand them (or take them more seriously than as a job-requirement), she was not equipped to ask more about atoms than she was required to teach about them. She never seemed to question her faith, even though she studied something that directly contradicted the existence of her God. If you remember information and are only able to repeat it to others, it means you are mostly a recording device.

It never works to tell people: "Hey, be more curious! Learn more about the world! Use your brain!", because that is like trying to encouraging a baby giraffe to eat without showing it how and from where.

In order for a brain to come up with new ideas, it needs to 'digest' information from many sources. The more ingredients it's provided, the more chances there becomes for new flavors to emerge.



As another example, I never understood what a molecule was when I was in school, but I understood it quite well after watching hundreds of scientific documentaries about many different subjects like medicine and how drugs are basically structures consisting of different types of atoms that we call molecules - nothing more than that. I had no clue that this was the case. That sparked my 'curiosity' about molecules and I found myself wanting to read more about them.

Later, after watching some documentaries about the weather that included how molecules relate to that, I asked myself whether everything in this world is based on these tiny 'molecule' structures. I researched on that and realized that this is pretty much true.

Then, knowing from other sources about what atoms are, I could understand molecules even better because they are formed by atoms. All of that information merged together for me, and my knowledge about molecules and how they work improved, along with my 'curiosity' about them and how the world works.

More interestingly, when you realize that drugs are made of molecules, weather/heat is a property of molecules and atoms vibrating, and thus, all matter/materials (steel, rocks, whatever) are formed by molecules, then you suddenly become able to exercise your imagination as to, for instance, how we could create everything we might ever need from atoms with the proper technology, and you end up inventing nanotechnology (although it has already been invented :)).

You see, the more you know, the more connections you can make. And the more you know about different domains of knowledge, the more you can come up with new, viable ideas.

Humans have invented many different categories for describing this world: biology, chemistry, dogs, furniture, planets, pain, etc.. While these categories help to define 'things', with many similarities between them and are generally useful most of the time, do not forget that they are only 'human-made' categories, and knowing that may help you to not let them limit your ability to think and learn.

Example: Two hundred or so years ago, the concept of biology was invented. Later on, some people realized that biology and technology could become one field and they called it biotechnology. Now we also have biochemistry, biophysics, nanobiotechnology, and so on, because more and more people have realized that the world is more connected than separated.

So, if you wonder whether or not it's important to learn about Earth's events, creatures, or how molecules work, and how they apply to The Venus Project, then you might not have been aware of the 'generalist' effect of knowledge from many different domains that Jacque talks about.

Here are just some of the many examples where I connected this type of knowledge directly with TVP: I know there are trillions and trillions of planets and moons out there, and when it comes to the possibility of life existing on any of them, the difference between a planet and moon is almost non-existent. It may turn out that there are more 'creatures' on moons than on planets, as moons are also planets; the difference being that they orbit around another big rock.

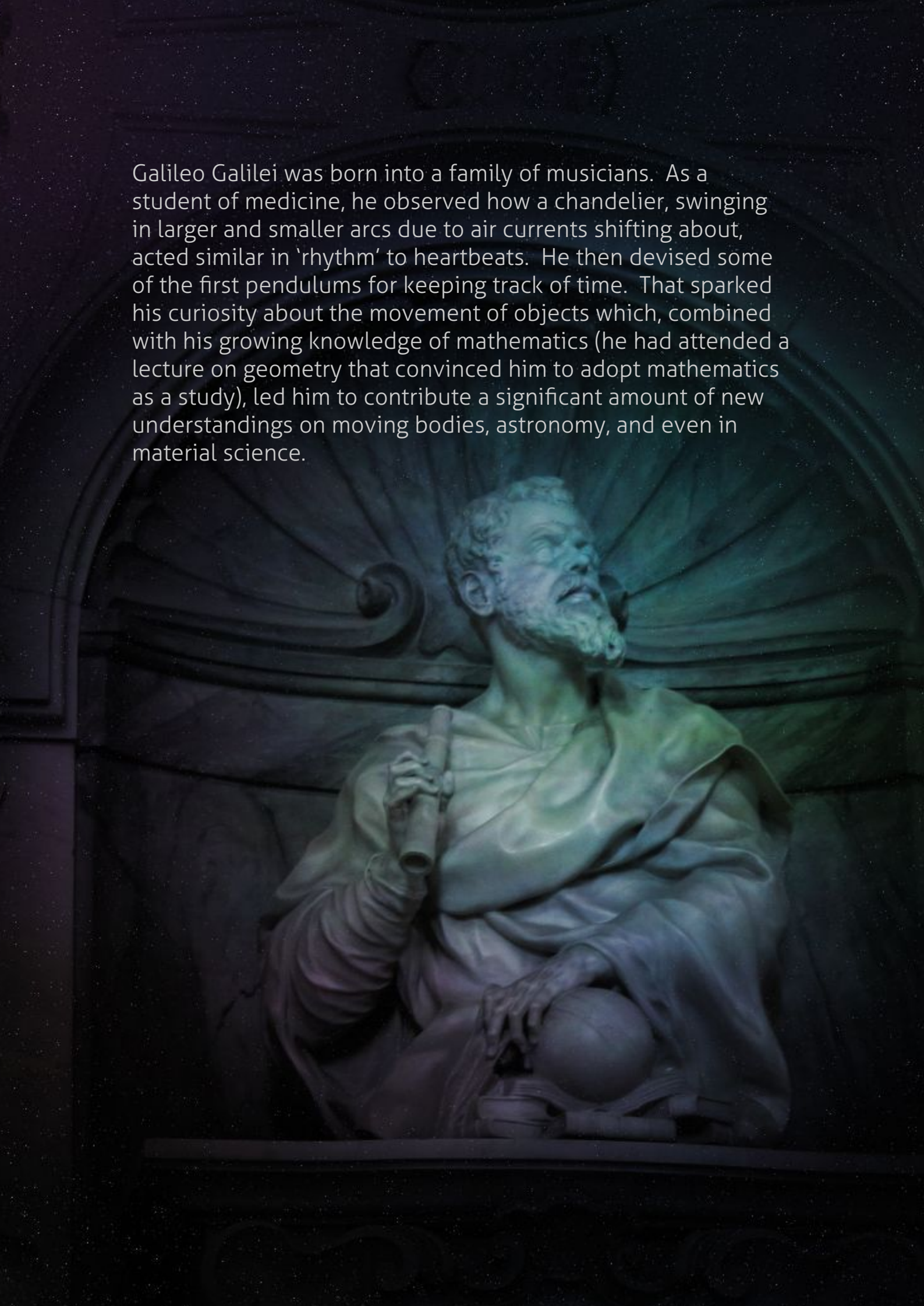
Recognizing how many possibilities are out there for life to exist, and combining that with the knowledge that I have about 'life' and the fact that we can't even definitively clarify what is alive and what not, I began to think of how many different 'things' may be 'alive' out there, and if we could even be able to understand that as 'life'.

For instance, a fly cannot understand humans, as humans may never be able to fully understand other 'creatures' that are more complex than ourselves. Then, with all that in my mind, I started to question human behavior and what is 'normal' to us, and how accustomed we are with the world we live in. When you realize that the fine tuning of gravity, atmosphere, water, distance from our Sun, and so on, are suited for the creatures we know as humans to 'evolve', then you can begin to exercise your imagination on thinking about how these same creatures (humans) might have evolved and behaved on a world with a bit less gravity, or a lower average temperature, or without our symbiotic breathing relationship with plant life, etc..

Would they travel more because it's easier with less gravity? If so, would cultures be more alike due to that ease of traveling? What if humans 'evolved' with their genitalia on their face? Would they still wear 'underwear'? :) How would obscenity evolve in that world? Knowing that our language and technology 'evolved' out of conditions here on Earth (inspiration from nature to human's senses were the basis for our language and technology), I wonder how 'language' would be affected if humans had 3 arms, or no sight, or could sense Earth's magnetic field.

All of these questions and associations, and far, far more than that, occur to my mind specifically because I watch and read about so many different, fascinating subjects: from other cultures to quasars, from how digestion works to how words came into existence.

Galileo Galilei was born into a family of musicians. As a student of medicine, he observed how a chandelier, swinging in larger and smaller arcs due to air currents shifting about, acted similar in 'rhythm' to heartbeats. He then devised some of the first pendulums for keeping track of time. That sparked his curiosity about the movement of objects which, combined with his growing knowledge of mathematics (he had attended a lecture on geometry that convinced him to adopt mathematics as a study), led him to contribute a significant amount of new understandings on moving bodies, astronomy, and even in material science.



One thing led to another:
Inspired by some well-known astronomers who developed a model of the universe with the Sun at the center and planets orbiting around it (contrary to what most believed at that time), and his knowledge of materials and mechanics, he was able and motivated enough to improve a new invention called a telescope (it was originally designed for 'ground' observations), point it at the night sky and discover that what was thought to be a 'star' was actually a planet. This series of events provided the first evidence that Earth is not that unique after all.

If Galileo did not understand complex mathematics, had not studied astronomy or been influenced by controversial theories to spark his curiosity about the heavens, and if he hadn't already become skilled enough to improve a 'machine' (the telescope) that someone else had invented, he could not have made this very important discovery.

This is why it's so important to learn many bits of information from the real world, across many domains. Learn all you can about the weather, polar bears, types of genitalia in the animal kingdom, lightwaves, automation, quarks, how the internet works, words & linguistics, varied cultures, the history of science, and so on. As you learn 'real' information about the real world, and recognize that the natural world is not categorised (broken up into 'topics') as we once thought it is, big ideas will become obvious to your mind, as you will see.

Even though your ideas (and mine) might not prove to be as perception-shattering as Galileo's, we will surely have a much more realistic view of the world we live in and, perhaps, be able to 'hack' some long-outdated categories and notions that have been holding us back, with our thoughts and actions becoming more and more inline with reality.

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