BIRTH OF COSMOS

Jos Werkhoven

I used Google translation to translate the three stories:

- Cosmos introduces itself
- Birth of cosmos
- The story of all building blocks

Google translate does that very well, but here and there something strange creeps in. That is no problem for the information, hopefully no problem for your language sense either.

INTRODUCTION

Kortenhoef, October 2018

Dear 'first users' of this book,

In my opinion, the main reason why we are going to tell our children the stories of the cosmos worldwide is to gain the awareness of a common origin.
A common origin gives a common responsibility.

Whether 'we' are star, moon, plant, animal or human, our origin is the same.
We should not expect direct aggression from the stars, the moon or plants.
As humans, we have largely overcome the aggression of wild animals.
But what about the aggression of fellow human beings?
In 1921, HG Wells wrote the following about this in response to the carnage of the First World War: *"There can be no other peace,*
we now realize, than a common, universal peace; no other prosperity than a universally prevailing prosperity. But common peace and prosperity are not possible without common historical ideas [...] Without anything but narrow, selfish, and contradictory nationalistic traditions, races and peoples must descend into conflict and destructive violence."

(From: HG Wells, Outline of History: Being a Plain History of Life and Mankind, third edition, New York, Macmillan, 1921, p. VI)

Maria Montessori also wrote the following about her cosmic education and teaching in 1947: *"Let us offer the child a vision of the entire universe. The universe is an impressive reality and an answer to all questions. We will walk this path of life together, for all things are part of the universe, all are connected with each other in an all-embracing unity. This image helps the child's mind to focus, to stop wandering in an aimless search for knowledge."*

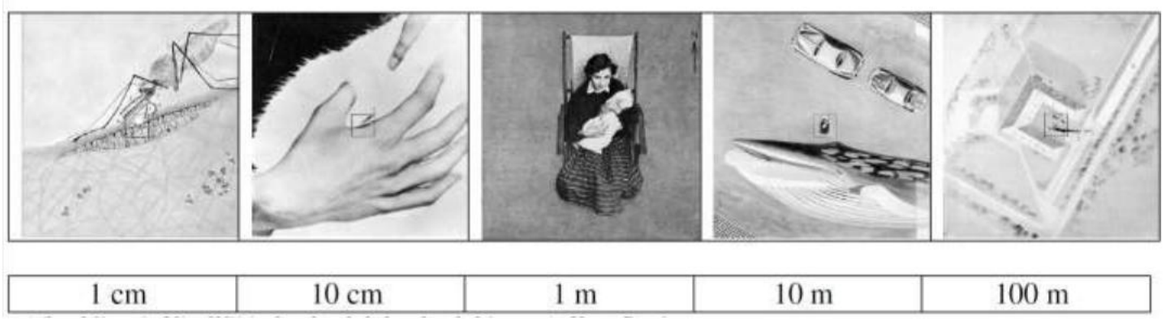
(From: Maria Montessori, Education and Human Potential. Dutch Montessori Association, 1998.)

Kees Boeke wrote in 1959 in the foreword to his brilliant book 'We in the Universe, the Universe in Us':

""".....All of us, children and adults alike, are inclined to live in our own little world..... if we do that, we can easily forget how vast the area of existing reality is and our attitude can then easily become narrow-minded and chauvinistic. It is necessary that we acquire a broader view, so that we can learn to see ourselves in our relative position in the great and mysterious universe in which we were born and live. School brought us into contact with various aspects of existence, but often they are not connected to each other, so that the danger is not imaginary that we collect a great many separate images, without realizing that they all together form one great whole. It is therefore important for our education as human beings to have means at our disposal that can give us a broader and more coherent picture of our world and thus a truly cosmic view of the universe and our place in it, a cosmic orientation."

(From: Kees Boeke, We in the Universe, the Universe in Us, 1959, Publisher Muusses and Meulenhoff.)
This book was the starting point for making both the book and the film 'The Powers of ten' by Charles and Ray Eams. The film can be viewed for free on YouTube; search for 'Powers of ten'.

What to do when you, as a teacher, tell and/or read this story?



From: Kees Boeke, We in the universe, the universe within us, 1959, Publisher Muusses and Meulenhoff.

The best thing is if you tell the story yourself. The story, there will be many more sub-stories to follow, then really becomes something of yourself with the children. We do not only teach; we have a story to tell!!!

If you want to be even more inspired to tell these special stories, read: 'Once upon a time . . . a story to tell . . . .!!!' You can download it here: **http://www.DeArend.nl/pdf/Er was eens.pdf**

In the text you will also encounter **green words .** These words are explained in **the glossary at the back of the book.** (To my regret, there are a few 'sequence errors' in this edition. These will be corrected in the next edition.)

You will also find **red frames** in the text with an **activity for the child** and/or **teacher.**
You choose when you do that activity.

You are among the 'first users' of this book. That means that it is definitely not 'finished' yet.
The first two stories were written by Jos Werkhoven as a 'finger test' in 2014 and now for the ENMS and the Montessori professional course for the first time. It is a first layout, there is still a lot of work to be done. However, it is the reason why I forbid you to copy. You may use everything for your own practice.

After completing the first two or three stories in book form, I will focus on describing the teacher's ability to tell Big Historical Stories themselves.
I told you before: it would be the most beautiful if every teacher tells his own story with the ingredients that the development of the cosmos offers us!!!

Now not every teacher is a born storyteller and then the stories could be read aloud. The expectation is that through the questions of the children this will still be an animated and meaningful activity. The children of the group can then independently read the story with the word lists regularly.

I wish you and your children a lot of fun telling the stories.

Jos Werkhoven

LETTER TO COSMOS

September 13, 2018, Kortenhoef, North Holland, Netherlands,
Europe, Earth, Solar System,
Milky Way, **Virgo Cluster,**
Cosmos

Dear Cosmos,

Wow Cosmos!

Thank you!
Thank you for asking me to tell your story.
What an honor!

I will do my utmost to write everything down as accurately as possible.
Luckily, I don't have to do it alone. I have the help of thousands and thousands of other people. People who have all done research on you.
If you only knew how many people are busy with that. Or have been busy, because they are no longer alive. But they have written down all their work about you! That is why we can still learn from it now. I will mention their names as much as possible. Then the children, when they go to college later, can read their work themselves.

It must be a great honor for you to know that so many people are researching you. People want to get to know you, Cosmos, better. Because if they know you, they will also learn more about themselves. After all, the sun and the earth with all its inhabitants (people, plants and animals) are only a very small part of you.

But. . . . . I'll start your story with a little story of . . . . . myself!
It's not a story about who I am. The kids can read that on the back.
No, it's a story about 'true' or 'kind of true' or 'not true'. Because a lot is written about you. We can say directly about a lot of things about you: "That's true!"
So I will definitely talk about that.
About other things about you we'll say, "Mmm..., I'm not sure, maybe it's a little bit true." I'll tell you about that too, but I'll say that we're not sure yet.
to know.
Sometimes real nonsense is written about you. There are people who say that the earth is 4,000 years old. We know for sure that that is complete nonsense. The earth is much, much older. We can prove that with evidence. You know that too. 4,000 years old is therefore absolutely not true! I am not going to write about nonsense, I think that is a waste of my time and the children have no use for it either.

Well Kosmos, then it is time for me to start. But . I want to thank you very much one more time! I find it really special to be able to do this work for you. I wish you all the best.

And I am sure that if the children know more about you, things will go much better for you too.

Hello Cosmos, warm greetings,

Jos Werkhoven

BUT FIRST THIS

Dear Earthling(s),

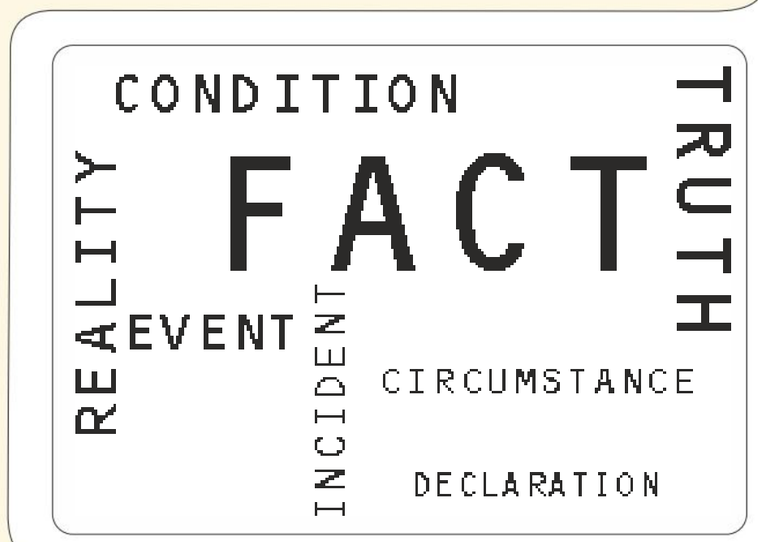
I promised Kosmos that I would tell a big story about Kosmos. I will do that for sure. But .
. . I'll start with a story about myself. It's not because I think I'm so important. It's not a story about who I am. Read that on the back of this book.

No, I think it's important that you hear this story.
It's about something you should never forget in your entire life.
It is about something that applies to every person on earth.
So it also applies to you.

It's about two (better is three) words: **fact** and **opinion (theory).**
(You don't have to look up the words in the dictionary now. I'll explain the words to you right below.)

Fact.

A fact is something that actually exists or something that actually happened.
Example of something that actually exists: the chair you are sitting on now.
That chair really exists!
You know that, your classmates know that, your teacher knows that.
Anyone who wants to can check if the chair is really there. We say: it is proven that your chair is there.
It's a fact!



Example of something that actually happened: you were born.
Your birth was real! It was a while ago, but it really happened. You know it, your father and mother know it, your classmates know it, your teacher knows it.

Of course, there are many more people who know this too: the doctor at the hospital (or the midwife at home), the printer of your birth announcements, the photographer who took pictures on your first day. . . .
I could go on like this for a while.
We say: there is a lot of evidence that you were born on that day in that year.
It's a fact!

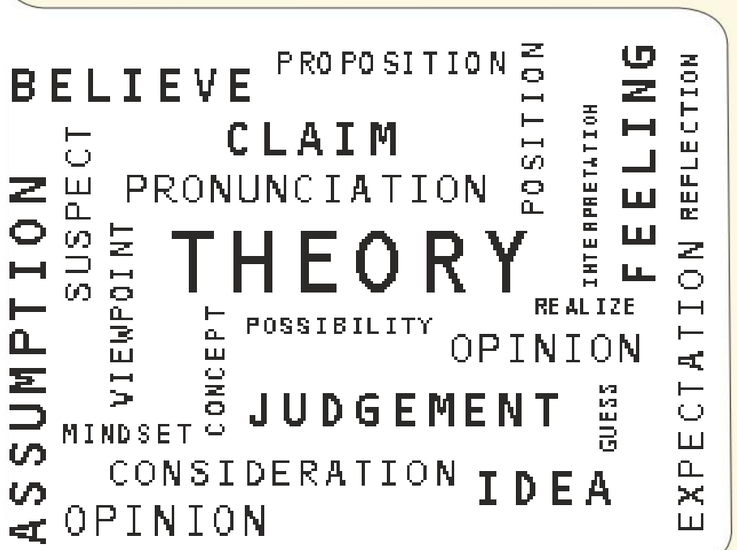
The nice thing about a fact is that anyone who wants to can check whether it is really true.
Anyone can check a fact now.
Anyone can check a fact tomorrow.
You can check a fact two months from now.
The outcome will always be the same. It's a fact!

Opinion

An opinion is having an idea about something.

Example: You say, *"I like apple pie!"* To you it seems like a fact: you liked apple pie last year, you like it now, and you will probably still like it next year. . . you don't know for sure whether you will still like apple pie next year!
But .

You think so, but you never know for sure.



Of course, there are many people who like apple pie. But there are also people who will never eat apple pie. They don't like apple pie.

So now we can't say: *"It is a fact that apple pie is delicious."*
Because it does not apply to everyone, we cannot call this a fact.

It's an opinion.

There are many more words that come close to it word opinion:
idea, concept, feeling, point of view, way of thinking, judgment, assumption, **theory .** . . . and many more . . . .
You can read them above in the word cloud.

I want to say a little more about the word theory, because that word will be used most in the big story.

Theory

A theory is an idea that most people think is correct.
There is a lot of evidence that this is true, but there are still questions that we have not yet found answers to.

An example.

No one can tell us how life began. We still don't know.
There are people who have ideas about this, but we cannot check them.
So they remain opinions.

We do have ideas about how life evolved. (You've probably heard of dinosaurs.) I'm going to tell you about that in a separate big story, but I'll do it very briefly now.

We have found clues all over the earth (animal and human bones) from a very long time ago. These clues have given us an idea of how life developed. And new clues are still being found.

These new clues tell us that our idea so far is correct.
So we already know a lot, but...we still don't have real certainty about everything.

So we cannot say: *"Our knowledge about the development of life is a fact."*
We can say: *"We have a good theory about the development of life."*

I hope you now know the difference between a fact and a theory.
If you don't quite understand it yet, that's okay.
In the big story I'm going to tell you, there are facts and theories.
Your teacher or I will ask you about developments in the story: *"What do you think? Is this a fact or a theory?"*

Well, now it's really time to start the story of Kosmos!

Activity on 'fact' and 'opinion'.

Teacher activity: philosophizing with the children

Filosofiejuf.nl has a nice tip that fits well with fact and opinion. She writes on her blog:
"Everyone can philosophize. Even if you are only four years old. In some ways, young children can philosophize better. You can't really ask too much of them. I will demonstrate this using quotes from conversations about the question 'what is real?'" This is what the philosophy teacher takes into account
when discussing the question "What is real?":
"I investigate the question 'what is real?' with four-year-olds in the same way as with twelve-year-olds. I have a beautiful box with me that contains all sorts of things. For example, a banana, a toy banana, a necklace made of camel bones, a fossil, a bag of cup a soup, a vase with a fake flower, a gnome, etc. One by one I conjure up these things and ask if that thing is real."

You can read this blog with quotes from filosofiejuf.nl at:
https://www.filosofiejuf.nl/filosoferen-met-kleuters/faq-filosoferen-is-dat-niet-te-moeilijk-voor-jonge-kinderen/#more-15744

If you search the internet for 'philosophizing with children', you will be presented with a great deal of information: books, websites, tips.

Child activity

- Ø Divide a sheet of writing paper into two columns.
  - Above the left column you write 'fact'
  - Above the right column you write 'opinion or theory'
- Ø In the facts column you write down things that you believe are facts.
- Ø In the opinion/theory column you write down things that you think are an opinion or a theory.
- Ø Discuss your work with as many others as possible.
  - Facts should be verifiable by everyone.
  - With an opinion or theory, that is not necessary.

Teacher activity

Depending on how the children evaluated each other's work, you can have the children give a plenary presentation of their own work.
The entire group then checks each fact or opinion/theory (or a selection thereof).
There's a good chance this will generate an interesting discussion.

INTRODUCTION

You have already become a little acquainted with 'Kosmos'.
Yes, I write it here in quotes.
Actually, the first sentence is not correct either.
I will now write the sentence correctly.
You have already become a little acquainted with the cosmos.
Do you see the difference?
It now says 'de' in front and cosmos is written with a lower case letter.

I think you already understood.
Cosmos (with a capital letter) is not a person who can talk.
Kosmos does not speak Dutch or English or any other human language.
In fairy tales everything is possible, but I'm not going to tell you any fairy tales.
I'm going to tell you everything man knows about the cosmos.

Cosmos is not a human being.
Cosmos is not a being.
Cosmos is.....just the cosmos! Other names are also used for the cosmos: universe, universe, world.

The cosmos is the name for simply everything, absolutely everything, known to man.
So the cosmos is not, for example, one 'thing'.
No, the cosmos is the collective name for all the things we know: you, your father, your mother, your dog or other pet, your plants in your garden, your house, your city, your country, the earth, the moon, the sun, all the stars and all the galaxies.
And also: your nail, your blood, the **bacteria,** atoms and everything else in your body.

Now I just said that the cosmos cannot talk.

But the cosmos is making itself heard!!!
The cosmos does not speak.
In many different ways the cosmos shows that it is indeed there.
That is why it is important to get to know the cosmos well.

Let me give you some examples so you can understand what I mean.

Example 1.
You become very ill during your holiday.
You ate something that contained bad bacteria.
You felt very nauseous for a long time and you had to do a lot yield.
(Was this ever a ***fact*** *for you?)*

Example of a tiny bacteria
Public domain
Alissa Eckert - medical illustrator

Example 2.

FACT

In November 2013, the Philippines was hit by one of the strongest storms ever.
The **Philippines** lie in the ocean.
The storm caused tidal waves of up to six meters high.
Thousands of people died.

Example 3.

About 67 million years ago, the dinosaurs became extinct.

THEORY

It is not yet known exactly what caused it, but we do have strong indications of how it happened.
So we say: we have a **theory** ! Most scientists agree that it was caused by a change in climate.
That change was rapid and dramatic.
Scientists suspect that **climate change** was caused by the impact of a **comet (meteorite)** or by a major eruption of a **volcano .**
In both cases, a great deal of dust would have been released into the air.
The dust in the air caused the sun to no longer shine on the earth.
Especially the larger animals could no longer survive.

Now you have seen the examples.
The different parts of the cosmos have not spoken.
The different parts of the cosmos have clearly shown that they are there.
In example 1, that was the tiny bacteria. The bacteria made you sick.
In example 2, that was the super storm with the six-meter-high waves.
The storm and the high waves destroyed houses and killed thousands of people.
In example 3 it was (presumably) the sudden climate change.
Climate change killed all the dinosaurs.

We now know that parts of the cosmos are very strong.
That is why man wants to know more and more about the cosmos.
We don't want to get sick. We don't want our house to be destroyed by a storm.
We don't want to drown in six-meter high waves.
And we certainly don't want to become extinct like the dinosaurs.

Well . . . . . by now I have already told you quite a lot about the cosmos.
But now the big story really begins: the origin (birth) of the cosmos!

Child activity

- Ø Form a group of 3-5 children
- Ø Look together for examples of the cosmos in which it clearly makes itself heard.

NB!
Man is part of the cosmos.
Create two columns:
- man-made
- caused by the cosmos

A war is caused by people.
An earthquake is caused by the cosmos.

(Interesting point of discussion, especially for the Netherlands: the earthquakes caused by gas drilling in Groningen.)

Ø Note down these examples and discuss them with the other groups.

Teacher activity

The purpose of this activity is to have children make an initial investigation into some of the strong forces at work in the cosmos

The cosmos is an indivisible unity.

There are (strong) forces at work in the cosmos which are caused by humans (urban development, war, deforestation, etc.).

There are (strong) forces at work in the cosmos that humans have no influence on (ebb and flow, earthquakes (pay attention to Groningen!!!), day and night, radioactivity from the sun, the weather
etc.

Now I mention 'the weather' above. However, the current climate change is also an interesting one in this: in the past always caused by the cosmos; the current climate change is most likely CO-caused by humans. Emphasis on co-caused, because since the last ice age we have been in a period of warming caused by the workings of the cosmos.

The results of this first investigation of the children are discussed in a group discussion.

Obedience to the laws of nature (cosmos) is an important feature of our work in presenting the big historical ideas to the children.

"Rocks, water, air, solids, liquids, gases: each is what it is because of a difference in temperature." Mario Montessori, 1958, God Without Hands.

FOR YOUR BIRTH

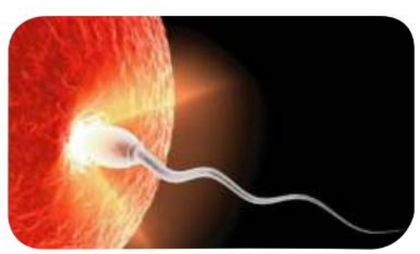
FACT

In the picture above right you see how a male **sperm cell** (the little creature that looks like a tadpole) is on its way to the female **egg cell** (round ball). In reality it is thousands of sperm cells.

Photo bottom right: because the cell wall is hard, it is not easy for the sperm cell to get into the egg cell. If one sperm cell is inside, the two cells fuse and no more sperm cells can get in.

We say: *"The fertilization is a fact! The child can start growing."*

The sperm cell was discovered in 1677 by the Dutchman Antoni van Leeuwenhoek. He saw the cells crawling when he examined his own under the **microscopesperm** laid.



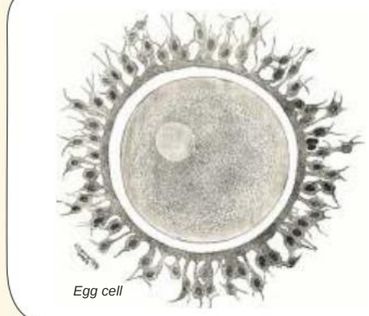
FIRST YOUR BIRTH

FACT

Before you were born, you were smaller than tiny. You were just barely visible to the naked eye.
You **1/10 millimeter** big...or rather: you were 1/10 millimeter small!
were You were also still warm and dark hidden in your mother's body.
You were a tiny little egg.

You were a piece of cake!

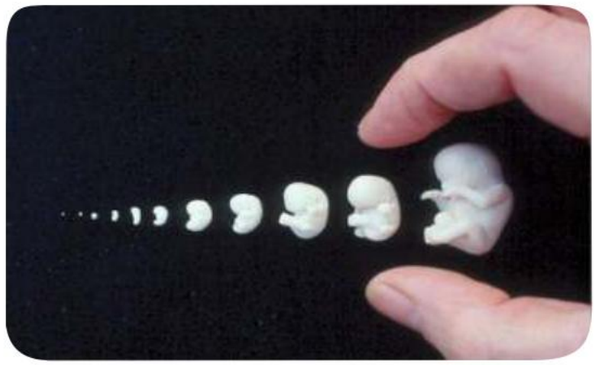
I'll put it bluntly: you were an **egg** (pictured right).
When your father's **sperm** entered your egg, you began to grow.
(Read and watch further at the bottom left under 'FOR YOUR BIRTH').



Egg cell

After eight weeks (two months) you were already quite mature.
You already had arms, legs, head, fingers, toes, ears, eyes, heart and lungs.

And yet you were only 2 and a half centimeters 'small'. See the photo below.



But you still had to grow for seven months before you could be born as a baby.
And from that period on, I think, you know a lot more.

Many photos and/or videos have been taken of you.
Your father and mother have told you a lot about you.
And from the age of three or four you can also remember things from your own life.

But how did the birth of the cosmos happen?
There are no pictures of that.
No midwife or hospital was involved.

And no birth announcements were sent out either.

To be honest, we don't know for sure yet.
We have strong suspicions. We have ideas about it. We have theories.

These theories tell us the following story.

Child and/or **teacher activity**

Search YouTube for 'Cell To Embryo'
(English language; watch the video with your teacher or parents to help with the translation).

You can see very clearly how you grow from a cell to an **embryo** in eight weeks.)

BIRTH OF COSMOS

You were born from a tiny egg.

THEORY

The cosmos also most likely originated from one very, very, very small 'point'.
I call it 'point' here, because what exactly that point was and what it looked like, we don't know for sure.
Scholars call this point 'singularity'.
Scientists say: *"An infinitely small point with infinite* ***density."***
In our story, density means that the entire cosmos was compressed into one point.

In the photo on the right you see more than twenty blocks of compressed iron.
These blocks used to be cars, but at the scrapyard the cars are compressed.
That way they take up less space.

Now I'm going to really put your imagination to the test.
Concentrate hard; prepare yourself to imagine something that may be 'unimaginable'!

There he goes!
Now we're not just going to have cars, but a lot more to compress.
Let's start here in the classroom at school.
Everyone empties their drawer and we put it all in one pile.
We can have a press machine that looks like the picture on the right. We just need a different kind of gray blocks: blocks that you can press a ball with. But you can imagine that, right?

In the top photo, the two gray blocks are apart; in the bottom photo, the two blocks are pressed together.
When we use our ball blocks, we can compress everything from our drawers into one ball.
All notebooks, books, pens, (coloured) pencils, rulers, pencil cases and whatever else you can find in drawers are compressed into one ball of about one centimetre.
That must be a heavy ball!

Nice? Let's move on.
All tables and chairs, cupboards, board, digital board, computers and all other furniture you have in the classroom: in the press machine.
I can hear you thinking: "That will never fit in that machine?"
Absolutely! But you can probably imagine that we could use a somewhat larger machine for that. So we do.

And again we press everything, including the previously pressed ball from our drawers, together into another ball of about one centimeter.

What do you think? Can you lift that ball?

Once you're done trying to lift that one-inch ball, we'll move on.
(Is it true that you didn't succeed? Or did you? Because for each child you have to lift the weight of your table and chair together plus the weight of the rest divided by the number of children. I can't make that estimate; I don't know how many children you have in your class and I don't know what kind of furniture is there.)

I dare say that I know you can imagine that it is a very heavy ball!

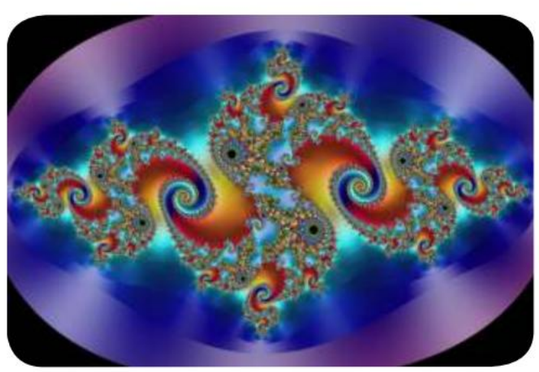
Pffffff!!! It's tiring work! And we've only just begun!

Now that we're done with our own classroom, you may already be guessing what the next step is.
Very good: all other classes!
And of course you understand that we need another bigger press machine for that.
No problem: we can imagine that it exists. And so we all cram all the classes into the super large press machine. We like neat and tidy: we cram the rest of the school building in too, so that we now have everything from the school in one small ball of about one centimeter. What an incredibly heavy ball that must be!

As I just said, "We've only just begun!"
What shall we compress next?
I hear the street. I hear the whole neighborhood too. Don't I hear the whole village there too?
Yes, let's tackle it big. That way we'll make good progress; there's still a lot to do.
We're going to compress the whole village.
Then we will need a much bigger press machine again!

Have you noticed that we actually always do the same thing, but just a little bit different, a little bit bigger?
We compress something. The only thing that changes is the 'something': that 'something' becomes bigger and bigger.
We started with your drawer, then the tables and chairs, then the rest of the furniture, the whole classroom, all the other classrooms, the whole school, the whole village.
We can say: we always follow the same pattern, only we take a bigger step each time.
We repeat the same pattern, only bigger and bigger. We call that **repeating patterns.**

At the bottom left you see the **repeating Fibonacci patterns** that can be found everywhere in the cosmos.
At the bottom right you see a **fractal:** a drawing made by a computer that uses repeating patterns.



Great. Now that we know a little more about repeating patterns, let's speed things up.
The last thing we squeezed in was the entire village.
Then we now squeeze together all the villages and towns of the entire province.
And when we're done with that, we'll squeeze the whole of the Netherlands together. And don't forget: we'll squeeze each time into a very small ball of about one centimeter.
Can you imagine how heavy that little ball will be now???

I think you understand by now how we will continue. After the whole of the Netherlands, of course, the whole of Europe follows. And then all other continents follow: Asia, Africa, North and South America, Australia and Antarctica.

So far so good. Now that we're done with everything on the earth, we're going to squeeze the whole earth together; at the end we'll throw in the moon too.
And we still have a one centimeter ball.

Now it's our entire Milky Way's turn.
On the right you see galaxy NGC-6744, a galaxy that looks very much like our own Milky Way.

We already have the Earth. Now we squeeze in Mercury, Venus, Mars, Jupiter, Saturn, Uranus and Neptune; we also take all the associated moons of the planets. We save our star the Sun for last.

Now that we have compressed the first star with planets and moons, we know very well how to compress very hot and large objects.
We take up the challenge: if we can squeeze one star with planets and moons, then we can also do it with:

l 10 stars,
l 100 stars,
l 1,000 stars,
l 10,000 stars,
l 100,000 stars,
l 1,000,000,000 stars
and finally the estimated number of stars in our Milky Way:
l 500,000,000,000.

And we still have a one centimeter ball.
I almost don't dare ask: *"Can you imagine how heavy that little ball must be now???"*

It's a good thing we're almost done now. We're going to use repeating patterns one more time.

If we can squeeze one galaxy with all the planets and all the moons into it, then we can also squeeze:

l 10 galaxies,
l 100 galaxies,
l 1,000 galaxies,
l 10,000 galaxies,
l 100,000 galaxies,
l 1,000,000,000 galaxies,
l 1,000,000,000,000 galaxies,
and finally the estimated number of galaxies in the cosmos:
l 2,000,000,000,000. (pronounced: two trillion.)

And we still have a one centimeter ball.
That is to say: we always pressed a ball of one centimeter.

Of course, I could have put the whole story of compression, from the contents of your drawer to all the galaxies, much more succinctly: we compress everything, absolutely everything in the cosmos, into one point.

Some scientists say, “That point couldn't have been bigger than a small soccer ball.”
Other scientists say, “That dot was no bigger than one atom!”

I will now let one scientist speak who will teach us a great deal about **Big History** His name is David Christian; the book he wrote this in is called 'Big History'.

*“While **cosmologists** are still scratching their heads over the one moment when our universe appeared, they have a thrilling story to tell that begins (take another deep breath and hope I'm right) a billionth of a billionth of a billionth of a billionth of a billionth of a billionth of a second after the universe appeared.*

In its simplest form, the story goes like this: our universe began as a point smaller than an atom. How small is that?

Evolution has endowed humans with brains that are designed to deal with things on a human scale. That is why humans have difficulty imagining anything extremely small. But perhaps it helps to know that you can compress a million atoms into the period at the end of this sentence.

At the moment of the beginning of the cosmos, the entire universe was smaller than an atom. All the energy and all the matter that our current universe contains was packed into that one point. Everything.

That's a mind-boggling idea, and at first glance it might seem like complete madness.
But all the evidence we have right now points to the fact that this strange, tiny, insanely hot object really existed 13.8 billion years ago.”

That is unbelievable!!!
Compressing everything, absolutely everything, into one point.
That point was unimaginably hot: billions of degrees.
That point was unimaginably heavy.
We still don't know where that point came from.
We still don't know what came before that point.

When I started this story I asked you:
"Be prepared to imagine something that may be 'unimaginable'!"
And? What do you think about that? Can you imagine it?

Child and **teacher activity**

At this 'point' I think a moment of reflection is well in order. The curiosity about the answers to the following questions to the children is great: - *"What do you think about that?"*

- *"Can you imagine it?"*
Jos Werkhoven would greatly appreciate it if the children emailed their ideas about this to:
Werkhoven@DeArend.nl
It may also be a good time to pause once again to consider 'the fact' that, although we have good theories. According to David Christian: "*. . . all the evidence that we have on this moment in hand suggests that this strange, tiny, and insanely hot object is 13.82 actually existed a billion years ago."*
But perhaps in the future we will come to new answers.
And maybe you, children, are the new scientists who will find the new answers find!

THEORY

We think we know that in a billionth of a billionth of a billionth of a billionth of a billionth of a second, that point suddenly became very, very, very big.

We call that the 'Big Bang' or 'Oerknal'. (Big Bang is English for 'big bang'.)
Of course, nobody knows what it looked like, but people like to imagine it anyway. On the front page you can see what Jos Werkhoven made of it.

Below and on the next page you will also find a number of artistic and humorous images of the Big Bang.

Why do we think we know that everything comes from one point?
The universe, the cosmos, is still expanding. That is to say: it is becoming bigger and bigger.

We can measure that. So that's a fact!
The sample you find at the bottom of the page clearly shows this.

First do the experiment and then read on.

In reality, scientists believe that this is what happened to our cosmos.
As galaxies move further apart
To be there, they must have come from somewhere.

Scientists believe that this is what happened to our cosmos: that everything came from one infinitely dense point; the birth of the cosmos.

Well, well.
Now that's a birth!!!
Your birth was already very special.
But what do you think about the birth of the cosmos?

There's no need to compare, you know.
Both births are spectacular and special.

And...the birth of the cosmos is also a bit of your own birth.
I will explain it in the next piece: the growth of the cosmos after birth.

Child and **teacher activity**

Take a balloon and blow it up partway. Using a felt-tip pen, put dots all over the balloon.
Each dot represents a galaxy.
Blow up the balloon further and see what happens.

All the dots are getting further apart. All the dots are getting further away from the center of the balloon. The same thing is still happening with all the galaxies. So the cosmos is still getting bigger.

Now let all the air out of the balloon. What you will have left is a small pile.
All the galaxies are now close together.
All the galaxies are close to the center of the balloon.
You could say: all galaxies are close to one point.

GROWTH OF THE COSMOS

You have grown spectacularly in a short time after your birth.
You can also say the same about the cosmos.
In a spectacularly short time (one billionth of a billionth of a billionth of a billionth of a billionth of a second) the cosmos came into being.
The cosmos was so big right away that scientists wonder if we will ever know how big!

What happened immediately after the birth of the cosmos?

Something arose that we called a **contradiction** call. The Big Bang was something that looks like a gigantic explosion. In an explosion, everything is thrown outwards from the centre (see drawing).

Along with that incredible explosion came **gravity.**

Gravity wants to hold everything together.
If that isn't a contradiction!
The explosion blows everything apart.
Gravity wants to hold everything together.

But in the beginning, gravity had no say.

The force of the ejection was so great that we can still measure it today: the universe is still expanding.

Gravity got its chance later and did very important work. In the following stories I will tell you much more about this. We are still at the beginning of the creation of the cosmos.

TIME	TEMPERATURE of the universe
less than a millionth second after the big bang	50,000 billion degrees Celsius
one hundredth of a second after the big bang	a hundred billion degrees Celsius
three minutes after the big bang	one billion degrees Celsius
three hundred thousand years after the big bang	5700 degrees Celsius
one million years after the big bang	three thousand degrees Celsius

That beginning was incredibly hot. Everything that was thrown out formed a big red-hot mess that grew bigger and bigger.
This porridge is also called primordial soup.
We still don't know exactly what that primordial soup looked like. Scientists are doing a lot of research into it.

We already know that the primordial soup consisted of very small particles, even smaller than an atom, and they gave off light. But the primordial soup was still such a thick 'soup' that no light could escape from it.

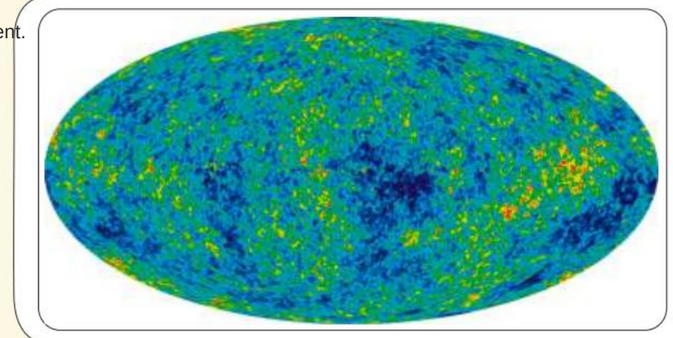
So it wasn't a clear 'soup' that you could see through.

Compare that to peanut butter and water.
You can't see through peanut butter. Light can't see through it. You can see through water.
Light can pass through that.

After about 300,000 years, **matter** was formed: the first atoms were created.
And with that, particles of you were also born: **hydrogen.**
Remember when I wrote: *"The birth of the cosmos is also a bit of your own birth"?*
Hydrogen is the most abundant building block of the cosmos.
Of all ten building blocks, nine are hydrogen. (90%)
You too are one-tenth hydrogen.
So you are already one tenth of 13,799,700,000 years old! (13,800,000,000 - 300,000)
There you go! Don't let anyone call you a 'youngster' anymore!

Water is built from the building blocks hydrogen and **oxygen.**
And you are also made up of three-quarters water.
You really are a big part of the cosmos!!!
In the next story of 'Building Blocks and Luminous Stars' I will tell you much more about this.

379,000 years after the Big Bang, the primordial soup had cooled so much that the universe became transparent. Light became measurable for the first time. We can still measure that first light today.
We call that light background radiation. The photo here (the childhood photo of Kosmos!) is a photo of that background radiation.
In some places there is a lot of light (yellow and red).



In some places there is little or no light (light and dark blue).

Your birth lasted ??? hours?
(Just ask your mother, she will probably still remember.)
On average, a human birth takes 6 to 8 hours. But there are also much faster births (2-3 hours) and very long births (longer than 24 hours).

So the birth of the cosmos took about 379,000 years.

At least, that's what I call it! (JW) I think: after 379,000 years there was the first matter (atoms) as we know it now. Then the cosmos became measurable.
The measurements revealed the cosmos; the cosmos was born.

On the left you see another beautiful image of Pablo Carlos Budassi. Since our brains are nearly impossible to comprehend the vastness of the cosmos, he created this image to try to help us.

So it's not an actual photo, but the image is very nice.

Teacher activity. *Read more about this special image:*
https:// www.volkskrant.nl/ nieuws-Background/ het-ziet-eruit-als-een-fruitscale-maar-het-is-een-wiskundig-kunststukje~bbc56589/

GLOSSARY

Unfortunately, the words are not all in the order they appear in the story.

This will be improved in the next edition.

Virgo cluster

Galaxies often cluster together. **Gravity** pulls them towards each other.

Cluster is another word for group. A cluster can contain up to 1000 galaxies. Our Milky Way (the galaxy where our sun is one of billions of stars) belongs to the group called Virgo Cluster.

The photo on the left is a small part of the Virgo Cluster. There are countless groups of galaxies.

Fact.

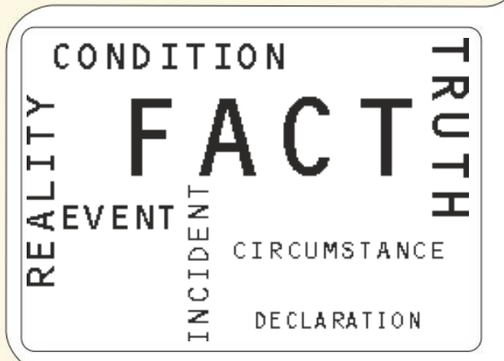
A fact is something that actually exists or something that actually happened.

Example of something that really exists: the chair you are sitting on now. That chair is really there! You know it, your classmates know it, your teacher knows it.

Anyone who wants to can check whether the chair is really there.

We say: it has been proven that your chair is there.

It's a fact!



Example of something that actually happened: You were born. Your birth was real! It was a while ago, but it really happened.

You know that, your father and mother know that, your classmates know that, your teacher knows that.

Of course, there are many more people who know this too: the doctor at the hospital (or the midwife at home), the printer of your birth announcements, the photographer who took pictures on your first day... . I could go on like this for a while.

We say: there is a lot of evidence that you were born on that day in that year.

It's a fact!

The nice thing about a fact is that anyone who wants to can check whether it is really true.

Anyone can check a fact now.

Anyone can check a fact tomorrow.

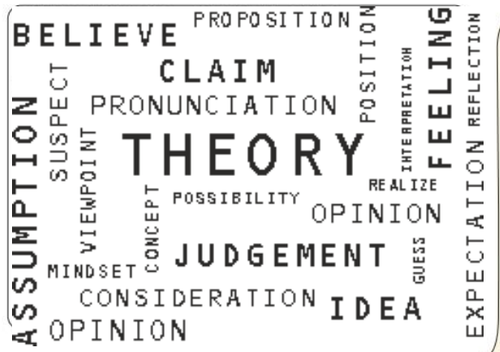
You can check a fact two months from now.

Opinion

An opinion is having an idea about something.

Example: You say, “I like apple pie!”

Only to you does it seem like a fact: you liked apple pie last year, you like it now and



You'll still like it next year.

But... you're not sure yet whether you'll like apple pie next year!

You think so, but you never know for sure.

Of course, there are many people who like apple pie.

But there are also people who will never eat apple pie.

They don't like apple pie.

So now we can't say, "It's a fact that apple pie is tasty." It doesn't apply to everyone; then we cannot call this a fact.

There are many more words that come close to the word opinion (see word cloud):

idea, opinion, feeling, point of view, way of thinking, judgment, theory .... and much more....

I want to say a little more about the word theory, because that word will be used most in the big story.

Theory

A theory is an idea that most people think is correct.

There is a lot of evidence that this is true, but there are still questions that we have not yet found answers to.

Example.

No one can tell us how life began. We still don't know.

There are people who have ideas about this, but we cannot check them.

So they remain opinions.

We do have ideas about how life evolved.

You've probably heard about dinosaurs. I'm going to tell you about that in a separate big story, now I'll do that very briefly. We have found clues all over the earth from a very long time ago. Those clues have given us an idea of how life developed. And new clues are still being found. Those new clues tell us that our idea so far is correct.

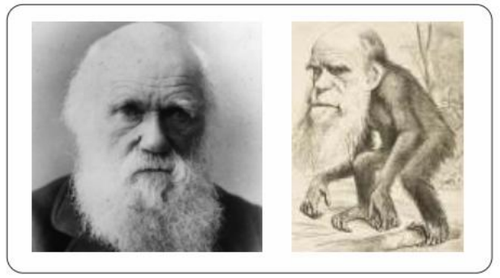
So we already know a lot, but...we still don't have real certainty about everything. So we can't say: *"Our knowledge about the development of life is a fact."*

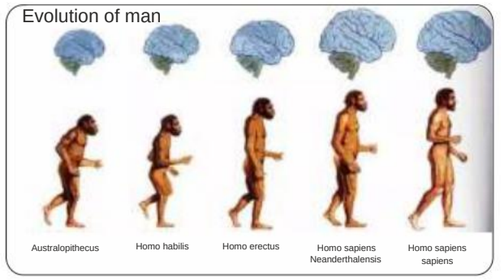
We can say: *“We have a theory about the development of life.”*

One of the most famous theories I have explained above. That is the 'theory of evolution' of Charles Darwin.

Charles Darwin (1809 - 1882) discovered the **repeating patterns** that tell us how plant, animal and human life evolved.

Here you see a real photo of Charles Darwin, right next to it a cartoon where they have drawn his head on an ape's body. When people for the





When they first heard about the theory of evolution, they were very shocked.
It was also explained that the ape is an ancestor of man. Many did not want to believe that. They declared Darwin crazy.

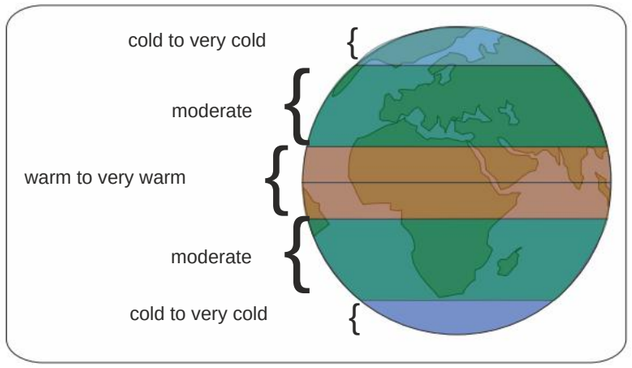
Philippines

The Philippines consists of a group of 7,107 islands that together form one country.

Those islands are located in the Pacific Ocean.
The Philippines belong to the continent of Asia.
On the world map you will find the Philippines at the arrowhead.

Climate change

The weather is not the same everywhere on earth as it is in the Netherlands.
There are places where it is always warm to very warm. There is a warm climate.
There are places where it is always cold to very cold. There is a cold climate.
The Netherlands is right in between.
We have a temperate climate.



The climate on Earth has not always been the same. There have been periods when a large part of the Earth was covered with ice.
There have been periods when there was no ice on Earth at all.
The transition from the cold to the warm period (or vice versa) is called climate change. We are currently experiencing very rapid climate change.

This climate change is largely caused by humans. (Ask your teacher, parents or other expert if you want to know more about this.)

Comet A comet is usually a small celestial body.
A comet orbits a star in an elliptical orbit (see ellipse at the end of the glossary).
When a comet gets close enough to a star and gets warmer, the comet gets a tail: part of the comet changes from solid to gas all at once. The gas is illuminated by the sun. (Also read **solid, liquid and gas.)**

It is very likely that a comet hit the Earth 67 million years ago. This impact was the trigger for climate change and the extinction of the dinosaurs.

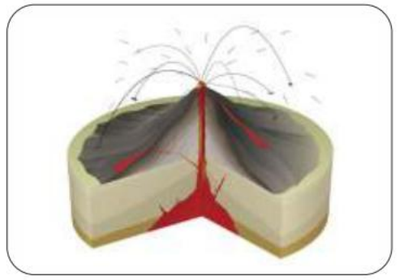
The photo shows Comet Hale-Bopp, photographed on March 29, 1997.

Meteorite

When a small celestial body hits the earth, we call it a meteorite. The imprint that the meteorite makes on the earth is called a crater.
On February 15, 2013, a meteorite hit Russia.

Search on YouTube with the words: 'meteorite impact'. Then you will see spectacular videos of it.

50,000 years ago a meteorite landed in the American state of Arizona; the Barringer crater.
The impact crater can be seen on the right of the photo.
The diameter (cross-section) of the impact meteorite was 50 meters; a pretty big rock! It made a crater of over 1186 meters in diameter, 170 meters deep and the rim that came up was 45 meters high.



Volcano

A volcano is an opening in the surface of a planet through which molten rock (magma), gas, and fragments of solid rock emerge.

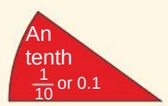
A volcano is also called a fire-breathing mountain. Deep in the earth there is red-hot liquid rock. We call that liquid rock magma.

Sometimes that hot rock finds a way through the earth's crust. The rock then cools down and forms a mountain.
When I tell you more about the formation of the earth later, I will also tell you more about volcanoes.

Search on YouTube with the word: volcanic eruption. You will see a spectacular video. The photo on the left is from the film.

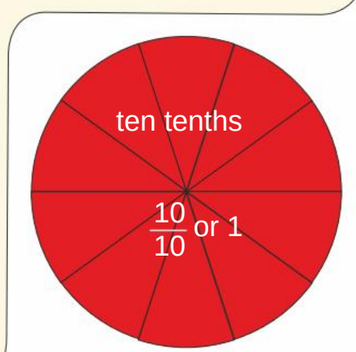
1/1 0 of $\frac{1}{10}$

If you divide something into ten equal pieces, each piece is called one-tenth.
You write it like this: 1/10 or 0.1 or 10 $\frac{1}{}$
Let's take this cake as an example.
(You can also take the fraction circle divided into tens.)



The pie is divided into ten equal pieces. One piece is called one tenth (1/10 or 0.1 or) The whole pie is then ten tenths (10/10 or 1 or 10).

$\frac{1}{10}$ $\frac{}{10}$



millimeter

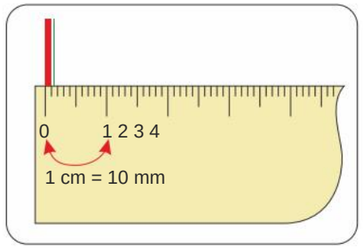
Milli is the French word for one thousandth.

So a millimeter is one thousandth of one meter.

If you divide one meter into a thousand equal parts, you have a thousand millimeters.

You can clearly see one millimeter on your ruler.
One centimeter is ten millimeters.

The red line is exactly one millimeter wide. The green line is exactly 1/10 millimeter wide.



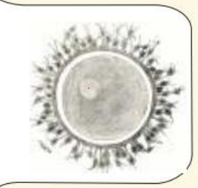
Before you were born, you were ten times smaller than this dot: The dot is 1 millimeter in size, you probably can't print a dot of 1/10 millimeter. (I'll try anyway. See if you can see it:) .

Egg cell

Our entire body is made up of billions of cells.

A cell is a tiny part of your body.

It is not visible to the naked eye. (I will tell you much more about cells later!)



Only women have egg cells. The egg cell is the largest cell in the female body. That is why it can be seen with the naked eye.
But... you have to look very carefully, because the egg cell is only about 1/10 mm in size.

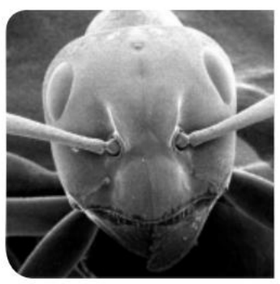
You see a picture of an egg cell. That picture is greatly enlarged.
When you look at an egg cell under a **microscope ,** you see what you see in the picture.
In the inner circle I put a red dot. That's how big an egg cell is in reality!

Microscope

A microscope is a very powerful magnifying glass.
A magnifying glass can make something appear twice as large, allowing you to see it better.

A microscope is an instrument that can magnify something up to 2000 times.

Things that you cannot see with the naked eye are clearly visible under a microscope.

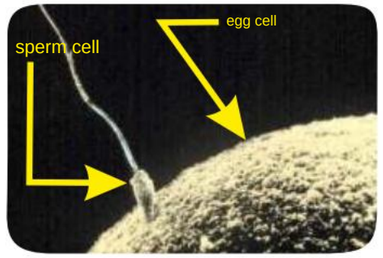


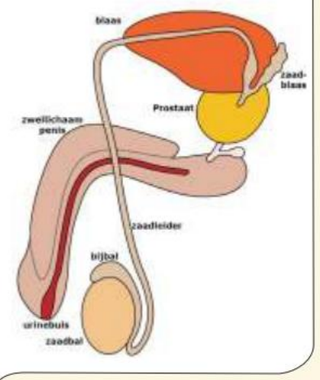
With an electron microscope we can magnify small things up to 100,000 times!
The photos on the left were taken with an electron microscope.
On the right you see a flea.
The monster on the left is a . . . . . ant!

Sperm cell

Women have an egg cell. Men have a sperm cell.

A sperm cell is much smaller than an egg cell (see photo).
A sperm cell can enter the egg cell. This is called 'fertilization'. A sperm cell fertilizes an egg cell.
(I'll tell you much more about this later.)





Sperm

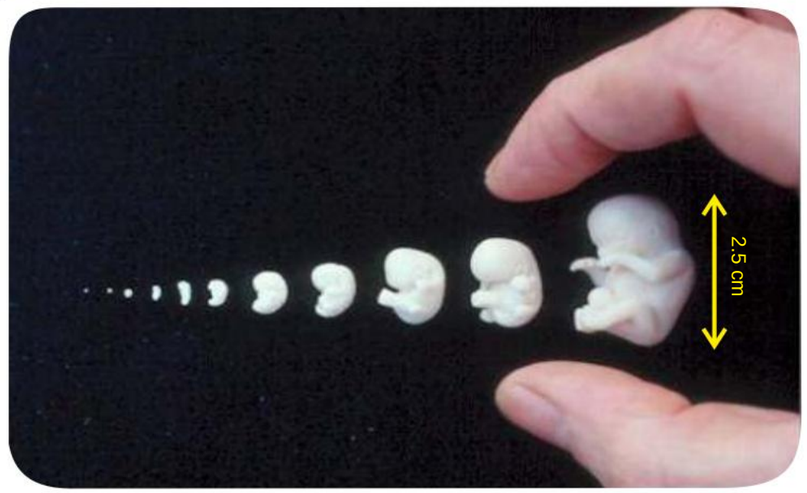
Is the fluid produced by the penis, the male reproductive organ, containing millions of sperm cells. The sperm cells are produced in the testicle.

Sperm cells can be introduced into the woman via the vas deferens and the urethra.

Embryo

Is the name of the little creature you were between the time of conception and eight weeks.
On the right you see a real photo of a 6 week embryo.

After eight weeks of development you were about 2 and half a centimeter.
About the size of the photo on the right (actual size).



You already had arms, legs, fingers, toes, eyes, ears, heart, lungs.
So you were already pretty complete, but of course you still had to grow further.

Density

In our story, density means that the whole cosmos was compressed into a single point.
So there is no greater density.

We also use density when we talk about a forest with so many trees that it is dark: *"The forest has a high density."*

The Netherlands is one of the most densely populated countries in the world. So many people live close together. We say:

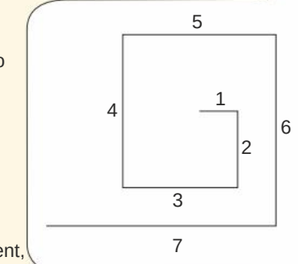
"The population density of the Netherlands is very high."

Repetitive patterns

Repeating the same thing over and over. These are repetitive patterns.
If only one thing changes and everything else stays the same, it's still a repeating pattern.

A simple example of a repeating pattern is this:
you take one step - turn a quarter turn to the right - you take two steps - turn a quarter turn to the right - you take three steps - turn a quarter turn to the right - you take four steps - turn a quarter turn to the right - you take five steps - and so on - and so on.

If you draw the path you take, you get this (see right):



Repetitive patterns can be found everywhere in your environment, nature and the cosmos.
Architects of apartment buildings, for example, often use repetitive patterns: see photo on the left.

Beautiful examples of repeating patterns are the **Fibonacci** sequence and the **fractal.**

Fractal

A fractal, sometimes also called a fractal, is a figure that resembles itself. Better to say: it is a *'geometric'* figure. Because the dimensions of the figure (measuring comes from measuring) are very important.
Something is always getting a bit bigger or smaller. The figure is therefore made of parts that resemble the figure itself.
Fractals can be easily created by a computer program; the program then repeats the same calculation over and over again. The only thing the program changes is the size (large or small). The term fractal was introduced in 1975 by Benoît Mandelbrot and is derived from the Latin fractus (broken).

Fibonacci

This is the Fibonacci sequence:
0 - 1 - 1 - 2 - 3 - 5 - 8 - 13 - 21 - 34 - 55 - 89
and so on.

Don't read any further yet, but try to investigate how this row is constructed.

The Fibonacci sequence is named after Leonardo of Pisa, nicknamed Fibonacci, who described the sequence in the year 1202 in his book 'Liber abaci'. In the photo on the left you see examples from nature and the universe that relate to the Fibonacci sequence.
The special row has interesting properties and connections that can be found everywhere in nature and the cosmos.

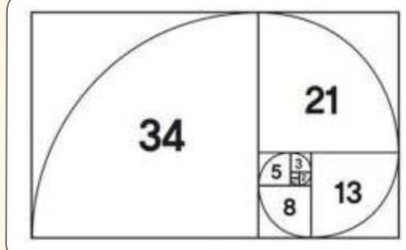
A nice English-language video is called: Great Demo on Fibonacci Sequence Spirals in Nature - The Golden Ratio. The address on YouTube: https://www.youtube.com/watch?v=iEnR8zupK0A
Searching on YouTube or the internet (images) with the word *'Fibonacci'* gives many more beautiful examples.

Also search the internet (under images) for 'Golden Ratio'.
(If you search in English you will always get more hits. Just search for 'Golden ratio')

This is how the Fibonacci sequence is constructed: you add the last two numbers together.

You start with 0 and 1.	You have 0 and 1
0 + 1 = 1	You have 0 - 1 - 1
1 + 1 = 2	You have 0 - 1 - 1 - 2
1 + 2 = 3	You have 0 - 1 - 1 - 2 - 3
2 + 3 = 5	You have 0 - 1 - 1 - 2 - 3 - 5
3 + 5 = 8	You have 0 - 1 - 1 - 2 - 3 - 5 - 8
5 + 8 = 13	You have 0 - 1 - 1 - 2 - 3 - 5 - 8 - 13
8 + 13 = 21	You have 0 - 1 - 1 - 2 - 3 - 5 - 8 - 13 - 21
13 + 21 = 34	You have 0 - 1 - 1 - 2 - 3 - 5 - 8 - 13 - 21 - 34

And so on, and so on.



Big History

Big History is English.
Literally translated: great history.

All the stories that are told to you or that you are going to read from 'Kosmos introduces itself' and this book 'Geboorte kosmos' up to and including 'Het verhaal van de toekomst', are stories about our 'Big History': 'Big History'. (I use the English name, because at universities and schools in the Netherlands the English name 'Big History' is also used.)

For the sake of clarity, I will briefly list all the 'Big History' stories for you.

- Cosmos introduces itself
- The Story of the Birth of the Cosmos
- The story of all the building blocks and the shining stars
- The story of our sun and our earth
- The story of life on earth
- The story of man on earth
- The story of agriculture and livestock farming
- The story of civilizations and cultures
- The story of mathematics (arithmetic, geometry, algebra)
- The story of language and writing
- The Story of the Modern Revolution.
- The story of the future

Big History tells us the big story that everything, absolutely everything, has a common beginning. All people on earth have a common history.
It seems very likely that most people do not know this (yet). This story is only told in very few schools.

If humans know this great story, we are more likely to take better care of the cosmos.
Taking better care of the cosmos means taking better care of everything, absolutely everything that is.
Taking better care of the cosmos means that we can solve our common problems together.

The main common problems are war, not every inhabitant of the earth has access to food, water and decent housing, climate change, unequal distribution of the earth's resources.
. . . . . and I'm sure you can name many more.

Cosmologist

Cosmologist is singular, cosmologists is plural.
A cosmologist is a scientist who studies how the cosmos is constructed and how the cosmos has developed from the beginning.

Contrast

Hot - cold
Large - small
Cheap - expensive
When you see these three comparisons, you immediately understand what a contradiction is.
The opposite of warm is cold.
The opposite of big is small.
The opposite of cheap is expensive.

You can also turn the opposite around:
The opposite of cold is warm.
The opposite of small is big.
The opposite of expensive is cheap.

Gravity

You have certainly come across gravity before:
- you have fallen before;
- you have broken a glass, plate or cup;
- you played with water: it always flows downwards.
Gravity causes anything not stopped to fall to Earth.
So the Earth 'pulls' on all objects on the Earth.

You probably know that the Earth is round.
Gravity ensures that nothing and no one can fall off the Earth.

Gravity works not only on Earth, but throughout the cosmos.
Gravity keeps the Earth rotating around the sun.
Oddly enough, we cannot measure gravity with an instrument.

Child activity

Search YouTube for 'Astronaut Jumps Up'.

- Ø Describe in detail what you see.
- Ø Compare walking/jumping on the moon with walking/ jumping on Earth.

We do know the following: the larger a celestial body, the greater its gravitational force (attraction).

The Earth is larger than the Moon. On the Moon, gravity is much weaker than on Earth.

But.....the moon's gravity is strong enough to cause tides on Earth.

You will hear much more and see examples of the power of gravity in the rest of the stories.

Matter (also read 'atom' in 'Cosmos introduces itself')

Everything we know (your pants, your body, water, car, mountain, cloud, the earth, the sun, the stars) is built with . . . . . building blocks.
We also call these building blocks (atoms) matter. Material comes from the word matter.
Everything is built from material.
To build 'something', different materials are usually used.
For example, a car is built with: metal (steel), plastic, rubber, glass, fabric and much more.
A house is built with: stone, cement, concrete, wood, glass, metal and much more.
In 'The Story of All the Building Blocks and the Shining Stars' you can read what materials you are built from.

What is very special is that we can encounter matter in three different ways:
solid, liquid and gas.

Solid, liquid and gas

All matter can be encountered in three different forms: solid, liquid and gas.
We can see this very well in water. Look carefully at what happens in the following experiment.

Teacher/child activity

You need: ice cube(s), pan, hotplate/stove/camping gas

- Ø Heat the ice cube in the pan.
  The ice cube is water in the form: solid.
- Ø The proof is in the pudding: after some time the ice cube has melted.
  The ice cube has melted into water in the form: liquid.
- Ø Continue heating the water.
  You can see that the water level is decreasing; above the pan you can see steam.
  Steam is the transition of water to water vapor.
  Further above the pan you no longer see any water vapour, but it is there (you will prove this yourself later).

- Ø After a while, the water will have completely disappeared from the pan.
  It is gone from the pan, but not gone in reality. The water is now in the form: gas.

So we know water in three forms:

- solid: ice
- liquid: water - gas:

water vapor

We have now gone from solid, via liquid, to gas.
The other way around

is also possible. I Breathe against a window (this works best when the window is cold). Water droplets form on the window. Water vapor condenses.

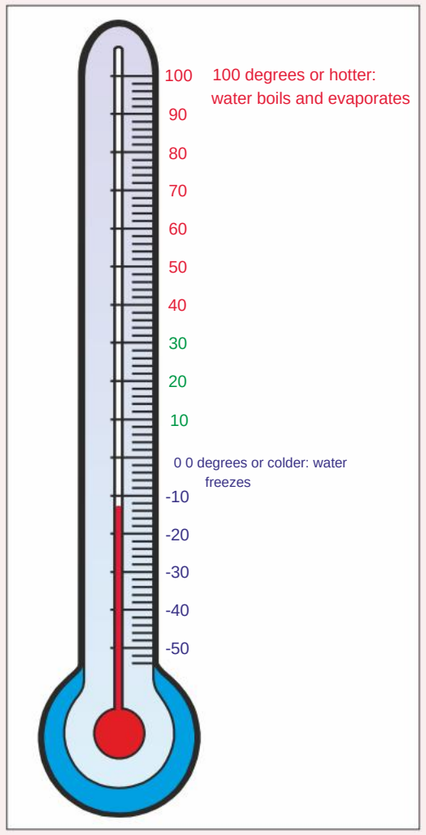
I Water droplets (water) can be cooled down very strongly to a temperature below zero (in the freezer compartment of the refrigerator). The water then becomes ice. Water solidifies (freezes).

Melting = from solid to liquid

Evaporation = from liquid to gas

Condensing = from gas to liquid
Solidification = from liquid to solid

Special: water does not necessarily have to be a hundred degrees to evaporate.
Even ice evaporates when it freezes!!!
It just goes much faster when the temperature is high.
It goes very slowly when the temperature is low.



Activity child Ø

Make three columns on a piece of paper: solid - liquid - gas Ø Write in each column which matter you know in the correct column.

Hydrogen

One of the first building blocks (atoms) that came into being 300,000 years after the cooling of the Big Bang.

It is also the most abundant building block in the cosmos.
Of all ten building blocks, nine are hydrogen. (90%)
Water is built from the building blocks (atoms) hydrogen and oxygen.

Oxygen

Oxygen is one of the most important building blocks for humans and animals.
Oxygen is in the air around us.

Try not to breathe. You can't keep it up for long! And don't do it for too long!
Because after just a few minutes your brain can already be damaged.
In case of drowning, you can no longer breathe, you quickly become unconscious and you die within an hour.

Oxygen and hydrogen together make water.

Water

Water, like oxygen, is one of the most important building blocks for humans and animals.
You are three-quarters water.
People and animals cannot live long without water either.
If you don't drink for a long time, you get very thirsty.

Not every person is the same, so the following times are averages.

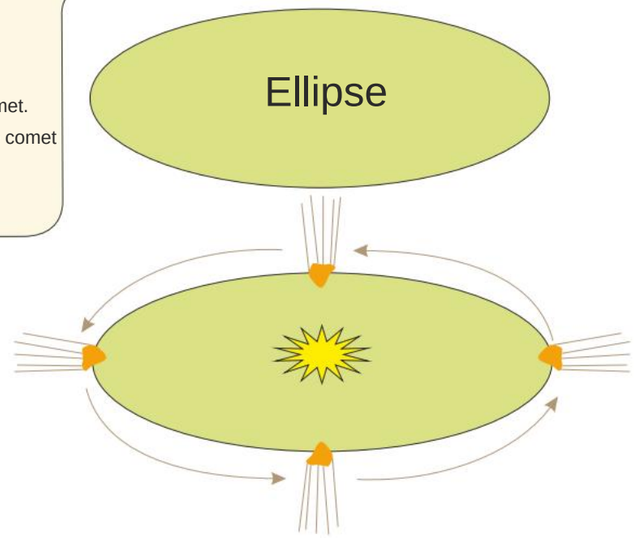
I A human can survive without oxygen for about 3 minutes without suffering any damage.
There are examples of people who have been in the water for a longer period of time and still managed to survive.

A 14 year old boy in Italy was stuck underwater for 42 minutes with his foot. He was in a coma (unconscious) for a long time, but he survived without too much damage.
But you understand: humans can only survive for a very short time without oxygen!

I A person can survive for about 3 to 4 days without water. I A person can sometimes survive for 30 to 40 days without food (but of course they have to drinks).

Ellipse

Ellipse is the name of the shape you see next to it.
In the second drawing I have drawn a star and four times a comet.
The comet follows the black line around the star. The tail of the comet is always away from the star.



COLOPHON

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This is a first experimental release.
Your comments and suggestions are greatly appreciated.

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ISBN:
978-90-77086-48-3

ORIGIN PHOTOS

Photo source if not from Jos Werkhoven

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Embryo (first eight weeks of development)
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Embryo
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ONCE UPON A TIME . . . .
A STORY TO TELL . . . .

ABOUT THE AUTHOR AND DESIGNER

Jos Werkhoven (1950) was a teacher, director and trainer in Montessori primary education for a long time. From 1995 to 2023 he was an independent publisher and developer for education.
In the mid-eighties of the last century he started his research into what is called cosmic education in Montessori education. In the mid-nineties of the last century he came into contact with Fred Spier of the University of Amsterdam and author of *'Geschiedenis in het groot'*. Fred had started Big History there together with Joop Goudsblom, among others, a new scientific discipline. It made cosmic education a universal story with responsible sources.

Since 1997 Jos has been publishing *'The Lines of Life'* . The subtitle of that material is: *"Once upon a time . . . a story to tell . . "*
Jos is deeply convinced of:

"Every person on earth has the right to hear the big story.
Every person may take note of what our scholars also know.
Every child should have the opportunity to learn what our scholars also know.
We need to tell this great story to children in our schools.
We should not tease children with isolated bits of geography, history, physics or biology.
These are just individual pieces of a beautiful puzzle.
At home they also like to put down the WHOLE puzzle. If a piece is missing, that sucks.
You can never enjoy just one piece. The WHOLE puzzle, that's beautiful!
Only then will you see and understand how everything fits together!"

This book, together with *'Cosmos introduces itself'* and *'The story of all building blocks'*, aims to be an example for the teacher to tell the stories themselves using the ingredients that the cosmos offers us.
Even if you tell it a little differently, it remains the universal story of man that tells about his origins.
You will be helped with this by the yet to be published *'Once upon a time . . . . a story to tell . . . . '*

Jos wishes you beautiful stories!