Micro - and macrocosm

secret of heavens

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Abstract

The universe is full of secrets. Outside the atmosphere of the Earth there is darkness, excluding the light of the stars and other objects. The distances between these objects are enormous and incomprehensibly large. We don't know if our planet Earth is the only planet in the universe where the life exists. Both possibilities are so confusing: No other planets with the life or some other planets with the life.

We are going to start our trip to the micro- and macrocosm from the Earth, step by step. The first step to the macrocosm is the Solar system. The Earth is one part of our Solar system. In the direction of our propagation the former step is always a part of the next step, a magnification. The next step after our Solar system is our galaxy Milky Way, which belongs to the set of the local galaxies. This set is a part of the group of one thousand millions of galaxies. Finally, this group is a part of the Giant group. We cannot imagine the size of the Giant group and the quantity of the galaxies in it. The first step to the microcosm is the human being (in Latin Homo Sapiens). The next steps could be a cell, a molecule, an atom, a nucleus of atom and so on.

We don't know if there is a limit at the end of both directions, and we could not go through it. If so, we only could wonder ourselves at this point: whatever might be behind this mysterious line!

The structuring principle in the universe

The Earth is a very exceptional heavenly body in the universe. It is the only planet in our Solar system where life exists. It might also be the only planet throughout the whole universe where life exists. Strange to say but it is as much wonderful if there is no life outside of our planet in the Solar system and even in our galaxy as there is some other planets where life exists. If we take up for consideration the sizes of these heavenly bodies as powers of ten, we notice that the diameter of the Earth is about 10^{7} m.

Macrocosm

The next step from the Earth to the space is the Solar system. The Sun, the planets, the asteroids and the comets belong to the Solar system whose size is about 10^{13} m. Among nine planets the Earth is also the only one where life exists as we believe at this moment. Many planets have satellites. Between Jupiter and Mars there is a zone

where asteroids are circulating the Sun. The comets circulate the Sun in the very elliptical orbits and return near the Sun after tens or hundreds of years. Our Sun is in the middle age at this moment. Our Solar system is a part of the spiral galaxy called Milky Way. We are located between the outer branches of spirals. All the visible stars belong to Milky Way, whose size is about 10 20 m. It is much more useful to give these enormous sizes in Light Years than in metres. One Light Year is about 9,5 billion kilometres ($9,5 * 10^{12}$ km), so we'll get the diameter of Milky Way about 100 000 LY and the thickness about 10 000 LY in the middle of the galaxy.

The next step is the Set of Local Galaxies, which our Milky Way belongs to. Its diameter is millions of Light Years.

This Set is a part of the enormous large Group of Galaxies with milliards of galaxies. The sizes of these kinds of Groups are milliards of Light Years.

The last step in the macrocosm from which we are going to discuss here is the Giant group. The Groups of galaxies form the Giant. We cannot even imagine the size of this group. We can only try to imagine where and how small the human being is.

Human being

The human being is a very special creature in the universe. He is the only one, who can speak, think and feel in a manner well adapted to its purpose. He has a soul and he is created by God in His own image. Man has got power to be the master of the creation with his own limitations. He is the only one who is responsible for his doings. He may have an eternal life even if he accepts it voluntary. As powers of ten the human being is 10^{0} m.

Microcosm

If we continue from the Earth and the human being to the microcosm, we shall meet at first e.g. cells. We can find many kinds of cells depending on where in the human body the cells are. The size of the cells is about 10^{-5} m.

In the cells we can find different kinds of molecules. The very famous molecule in the human body is the DNA-molecule. The breadth of the DNA-molecule is about 10^{-9} m and the length about 10 -3 m. The size of H_2O-molecule is about 10^{-10} m.

The molecules are usually formed of two or more atoms. The size of the atom is about 10^{-10} m and the size of the nucleus of the atom is about 10^{-15} m. There exists also smaller-sized particles than the atoms, such as electrons, protons and neutrons, but usually we think that the atom is the smallest particle in the constituent part of matter. In the modern physics there is a theory that the protons and the neutrons are formed of quarks. There are a lot of elementary particles with many kinds of properties.

Finally, we cannot even imagine how far we can go in the microcosm and how small world we may find. Perhaps, at the very final limit - we suddenly shall dive to the other world - and find ourselves to be in the macrocosm!

Construct the model of the micro- and macrocosm

This model is like an exercise book or a notebook. We are going to use the structuring principle on making our model. On the centre pages we shall put the Earth. It is our start point to the both directions: e.g. on the left there will be the macrocosm and on the right the microcosm (or opposite). The main principle on moving from the Earth to the macrocosm (i.e. to the left in our model) is that the former object is a part of the next one. The Earth is a part of the Solar system, so we put the Solar system on the next pages from the main pages and so on.

Respectively on moving from the Earth to the microcosm (i.e. to the right in our model) one can first find a human being, which is a part of the former object (the Earth). On the next pages there is a part of the object of the former pages and so on.

Instructions:

- Take six pieces of paper (A5) and fold them up and then staple the papers together.
- Cut off the pictures in the art collections.
- Put the Earth on the main pages.
- Construct the macrocosm on the pages to the left from the Earth and the microcosm to the right from the Earth respectively.
- Write the name of the object in the double pages on the headline.
- Calculate the sizes of the objects in metres using the powers of ten in Table 1 and then write the right size to the right upper corner of the double pages.
- If you like, you can colour the pictures. You can also write some information about the objects on each page.

Think about what you will get if you glue the first and the last page together! Make first a hole. Try imagine what happens if you go through the hole. Maybe you'll find another world!

Table 1. The sizes of the objects in the structure of the universe.

The object	Size in normal form	Metres in powers of ten
Earth	12600 km	
Cell	5-30 mm	
Milky way - galaxy	100000 LY	
Atom	0,1 nm	
Solar system	80 AU	
Elementary particle	point-like	
Molecule (e.g. H_2O)	0,14 nm	
Giant group	1000 Mpc	
Human being	1,6 m	
Local group	Millions of LY	
Group of galaxies	Milliards of LY	

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