



# Our knowledge

How much do we know?



# Structure

1. Our knowledge in the field of fundamental physics.
2. Another science.
3. Our ignorance.

# Physics

Is physics really so terrible and evil?  $\_ \_ (\text{ツ}) \_ \_ /$



<<<<<< Physics in practice

# Physics

Is physics really so terrible and evil? NO [ಠ\_ಠ]



To understand that physics itself is afraid of a lot of things, a number of consistent questions are enough.

Now you will see an example of how much we know, but at the end of my presentation we will understand how much we still have to learn.



## How much?

Imagine this situation: a very smart son constantly asks questions to his father:

S: Why is space colorless, and the sky is full of colors?

F: Because the air scatters light with a short wavelength stronger than the long-wave radiation of light. Because of this, during the day, shortwave blue light scatters more than red and others. In the evening, the position of the sun relative to the earth changes and the light along the tangent passes a different path, which leads to the scattering of red tones.

S:  $\text{L}(\text{D}_\text{D} \text{L})$



# Physics

As you can see, we can explain a huge range of natural phenomena. We know what an atom is, we can control the light, we know the structure of the universe (maybe). But it is a trap, later we will find out why.





# Chemistry

We all know what alchemy is, right? But some people still think that the glove of midas is possible. At the same time, it's wonderful and terrible that even a schoolboy can create an explosive device. We learned how to control biochemical processes, isn't that great? However, again this is a trap. Why, again, we find out at the end.



# Biology

We know how the brain and most organs of our body work. Our brain knows now how it works, great. Even based on school knowledge, you know how photosynthesis works, what life is and why it is really great.



# Our ignorance

S: hmmm... What is light?

F: It is electromagnetic radiation.

S: What is electromagnetic radiation?

F: This is a change in the state of the electromagnetic field.

S: Field, what does it mean?

F: Soooo....

S: What is the difference between light and gravity?

F: You see, in our time, gravity is not entirely clear .

S: What is time, why does time have a direction and does it coincide with a thermodynamic arrow?

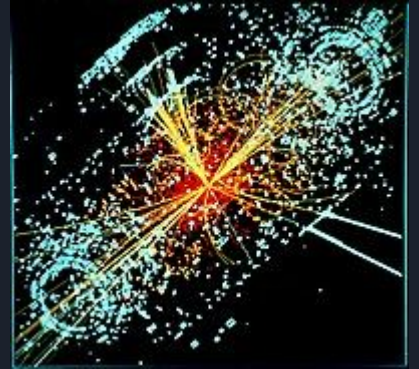
Father:



# Unresolved problems of modern physics

## General Physics / Quantum Physics

The arrow of time: Why does time have a direction? How is time different from space? Why did the Universe have such low entropy in the past, and why does time correlate with a universal (rather than local) increase in entropy from the past to the future according to the second law of thermodynamics? Why are CP-invariance violations observed during some decays of weak interaction and nowhere else? Are violations of CP invariance somehow derived from the second law of thermodynamics, or are they a separate arrow of time? Are there exceptions to the causality principle? Perhaps only one past? Is the present physically different from the past and the future, or is it just a state of consciousness? What connects the quantum arrow of time with the thermodynamic? How did people learn to agree on what is the present?





# Biochemistry problems

“Better Than Perfect” Enzymes: Why are reactions with some enzymes faster than diffusion?

What is the origin of homochirality in amino acids and sugars?

Protein folding: Is it possible to predict the secondary, tertiary or quaternary structure of the polypeptide chain, based only on information about the sequence of the polypeptides and environmental conditions? The reverse side of the question: Is it possible to design a polypeptide series that will adopt this structure under certain environmental conditions?

RNA Folding: Can the secondary, tertiary or quaternary structure of polyribonucleic acid be accurately predicted based on the primary sequence and environmental conditions?

The chemical picture of the origin of Life: How did non-living chemical compounds form complex, self-reproducing life forms?

# What can you do?

- 1) Study
- 2) Repeat
- 3) Trying to understand why
- 4) Get ready to get a Nobel Prize



Thanks for your attention