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It would be strange if there was only one universe

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The idea that there are more universes than ours has long been dismissed as nonsense. Now scientists are talking about multi-versa, if only because the theory that excludes only one universe would be. Now they must still observe that multi versa.

When talking about the multiverse from now until science can be counted, then there must also be discussed with precision over

Max Tegmark moved at the beginning of his career in two worlds. In one, he was an aspiring physicist, which are mathematical tools used to better understand what kind of world we live. In the other, he was a physicist explorer who speculated about and relied on other worlds: complete universes beyond ours. And like those universes are two professional worlds overlapped each other. Do not talk about, warned colleagues, that is not good for your career.

Meanwhile all that different. The Swede is now a professor at the prestigious Massachusetts Institute of Technology (MIT) in Cambridge. And while the idea of other universes formerly called comments like: "It's nonsense, and I do not like it", you now hear most: "I do not like it", as Tegmark said last month at a conference in Boston.

At a meeting of the American Astronomical Society led a session on cosmology Tegmark and other leading researchers in this field, such as Frank Tipler and Alan Guth, together to put on what the last instructions and thoughts in a row, they simply "the multiverse" mention.

When talking about the multiverse may now be said to be science must also be discussed with precision over Tegmark said in his contribution - and the recent, popular science book 'Our Mathematical Universe'. According to him, there are four types of universes, that you should not get mixed.

Ontiegelijk away

The first type is actually not so incredible - it's just ontiegelijk far away. In what we call the walk 'the universe', telescopes and other instruments of astronomers come to a natural horizon: the universe in the Big Bang formed about 14 billion years ago. Due to the finite speed of light - or any information in any medium - we can about objects that are further away than 14 billion light years, by definition, know nothing. As time passes, the visible universe bigger and you get to see. Pieces of the 'neighboring universe'

The second type of universe that can not. That is a universe of ours has become, since the expansion of the space after the Big Bang is not always and everywhere was quickly separated.

In the beginning it was rising rapidly, in a process called 'inflation' hot. That inflation has almost come to a standstill with us, but in other places need not be so. In such areas, constantly creates new space so much that light, they can not cross: then it is traveling on a road that extended faster than it can travel. So such areas separate parts of the room are fundamentally.



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If there is too much dark energy, the universe is expanding so fast that galaxies can not occur

A third type of "multiverse" has become famous as the "many worlds" interpretation of quantum mechanics. In theory, the best description of reality that we seem to be several things at once, or even should, be done. If you've tossed the coin shows both head currency. Generations of physicists have there head about how broken it may eventually heads or tails our eye sees. In the many-worlds interpretation that problem is solved by denying: both outcomes are real, the world splits in two variants at that time, and the observer only sees the world in which he finds himself apparently.

And if that was not punishment enough, Tegmark think there are possible universes in which mathematics which all the above ideas are based, is different. These are not worlds like ours, but other realities.

Physics has evidence that these other universes, this type of four, really exist? The answer, surprisingly, is yes. And that's says Tegmark, because those universes predicted by physical theories in other fields have proven accurate. Thus, the role of inflation in the emergence of 'our' universe have established. And the extra universes that arise because inflation is not locally stops just keeps going, you get there free bij. Tegmark: "It is very

difficult so to rephrase that you get them not inflation theory."

Dark energy

Of course it would be more convenient if you had direct evidence of the existence of other worlds. In a sense, the physicist Steven Weinberg such designation. Delivered in 1987 Weinberg thought about the value of the "cosmological constant", part of the Albert Einstein equations that describe the structure of space and time. Today, the constant a face: it is the "dark energy" that is present throughout the universe and keeps it off Dijing underway.

If there is too much of that energy, the universe is expanding so fast that galaxies can not occur. If there is too little, keep the universe expanding fairly rapidly with and ends with an implosion, leaving no time for the emergence of something like intelligent life.

Weinberg reasoned that if there are many universes, it is very likely that we live in a universe in which the cosmological constant is just right for the emergence of life. That prediction is not detected by a total of some physicists thought at about the size of the cosmological constant. But in 1998, Weinberg was right. Thanks to his foray into the multiverse.



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According to the theory of relativity by your laboratory information can not travel faster than the speed of light

Observing the multiverse of the Third Kind, "the many worlds of quantum mechanics is in fact already underway, according to Tegmark there are quantum computers under development, which would be much faster than ordinary can count. The most elegant way to describe it is that you let computers in many universes rely on a problem, and then gets the answer back to our universe. Accord

A direct method to observe other universes was announced in Boston by the American Andrew Friedman. He wants to do an experiment that another paradox of quantum mechanics examines the "crosslinked touch 'of small particles.

You can prepare two particles so that a measurement on one particle has an immediate impact on what you can find out about the other particle. Know That "immediately" applies literally: it does not matter how far the particles apart.

This experiment was devised by Albert Einstein and two colleagues, who so wanted to show that quantum mechanics was not complete. Because according to the theory of relativity by your laboratory information never travels faster than the speed of light. So had to be impossible that. 'Immediately' But in the eighties, the test could be performed for the first time and it was found indeed possible.

Two quasars

Unless ... in one way or another, the instruments that the two particles in progress do not take really operate independently. Maybe the quantum world so well put together that the experimenter unwittingly smuggling. To exclude the possibility that the "free will out" is mentioned, like Friedman leave the detectors 'serve' two objects that can not in cahoots with each other: two quasars, strong sources of light that are billions of light years of the earth, in opposite directions in the sky.

That physical phenomena of intelligent civilizations will have to let conspire against a laboratory on earth that two signals tendency is of course extremely unlikely, but the essence of the experiment is that they would be allowed to go quietly about their business: the history of the universe namely too short for them to arrange that. mutually

According to Zhang eventually the black holes in our universe are big and merge

Friedman thinks the experiment, the strange properties of quantum mechanics will confirm. But suppose it is not so, and that the signals so one way or another connected with each other, then it must be a remnant of contact between the two regions of space in a very distant past, when the universe was still small and quasars did not exist. Those areas should then cross-linked with each other have been hit, as well as the particles in the laboratory on Earth that is.

Friedman: "In some of the theories of quantum mechanics and gravity trying to combine space and time are not fundamental, but it's all about entanglement Whole areas of space can in that sense very close stayed together, even though they seem. they are far away. " If that's true, would open the way to a telescope that looks at other universes. Experiments in a sense like that of Friedman

We live in a black hole?

Max Tegmark such an outcome would of course love it. But he does not need to believe. In the multiverse him For him, that's just a result of how the world works. "If there is a process that makes things, whether rabbits or stars, it never makes that process there is only one. Why should it be different for universes?"

According to Dr. T. Zhang of Alabama A & M University is our universe is actually a black hole, floating in a larger universe. As it goes with black holes gobbling the radiation and matter that "mother universe", which allows the inside things happen that physicists, astronomers are familiar: expansion of space, the cosmic background radiation, the formation of galaxies, stars and planets.

Eventually, according to Zhang, the black holes in our universe will be great and will melt and the resulting super-black hole a new universe started out that our energy and matter are slowly strips. And so it goes on forever.

The idea is elegant because it explains in a very different way than usual, what we see around us. But to be accepted, it must also predict new phenomena that science can go looking for it and it still seems to be missing. Among scientists, there is little enthusiasm for a universe with the structure of a Russian matryoshka.

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