

08:06:14 | **Parallel Worlds**

What if the earth has long been the black hole?

Parallel universes have long been considered pure science fiction. Now this fantastic opportunity is being seriously discussed by renowned scientists. Argumentation aid is string theory. *By Guido Meyer*

The spaceship USS Cygnus has reached the edge of the black hole. Are louder robot on board. And an eccentric scientist. Dr. Hans Reinhardt wants to get into eyes into the black hole to switch into another universe - he believes to be immortal.

The sci-fi adventure "The Black Hole" with Maximilian Schell in the lead role came in 1979 in the cinemas. In the history of film, the computer animation set new standards, and the spectrum of horror ideas has since been enriched by a scenario: It creeps a lot of people, when they think of black holes. These eerie gaps in the universe swallow anything that comes too close.

"Fear not! Maybe we live all in a black hole", while astrophysicists announced at a convention of the American Astronomical Society (AAS) in Boston. One of these revolutionaries is Andrew Friedman of the Center for Theoretical Physics at the Massachusetts Institute of Technology in Cambridge. "We do not know what it looks like inside a black hole," he says, "but it could be that our entire world, the earth, our solar system, the Milky Way and the rest of the universe is in the center of a black hole. "

Thesis of the youngsters in astrophysics

With this exotic view Friedman is not alone. The Wild Ones astrophysics consider it possible that in every black hole is a universe could hide. Overall, then yields a coexistence of many universes that together form a multiverse.

The term multiverse there for some years. But so far was this idea as science fiction - as the mission of Dr. Reinhardt. But more and more cosmologists now believe that it is out there give a lot more than our supposedly single universe in which we live. And so the AAS has first approved the issue of "multiverse" at a meeting. Munter, the researchers discussed how you could probably prove the existence of a Muliversums experimentally.

But how do you verify a hypothesis so steep? You can not jump into some black hole eventually, to see if another universe is hidden in it. Hell heat and tremendous forces of attraction at the edge of a black hole would tear everything approaches him beyond recognition.

No one comes out each

Even if one were to assume completely unrealistic that Dr. Reinhardt could survive the flight to the hole - he would come out again Never more. He could not tell whether another universe in the black hole disappears. The universes in the black holes would be so all

separated. No object or even living beings could ever look at another of his universe.

Friedman illustrates this as follows: ". When we send a spacecraft toward the edge of the universe, it would never reach this, even if it is flying at the speed of light forever" For the Universe around us expands faster than the light moves. The even increasingly faster expansion of the universe exceeds the speed of light. We could not see out of a black hole Similarly, when would we actually sit in it with our universe.

By exploring black holes, we will question whether there are parallel universes, so can not answer. This is also Friedman clear. But there are other indications of the existence of a multiverse. For example, speaks the mysterious dark matter.

"Dark Matter" - an invented term

Astronomers have made the amazing discovery that there are regions in space, of which a gravity goes out, even though there is no matter - at least in any case no visible such as stars and galaxies. So they invented the concept of dark matter, which is not visible itself. What this dark matter could be is not yet clear. This is particularly predicament, as around 25 percent of our universe from this very dark matter to exist according to the researchers' calculations for the world of physics. Some astrophysicists explain the attraction by yet unknown, exotic particles. But sign up now and researchers to speak, the work of the parallel universes seen in these forces that are invisible to us.

Another indication of the existence of other universes could be the so-called Great Attractor. So astronomers call a mysterious, invisible force of gravity center, which is about 200 million light-years away from Earth. Here about ten trillion solar masses are gathered together in a confined space. And no one really knows which these enormous appeal is concluded. Does this perhaps a neighboring universe somehow in the in ours?

Constants of nature make people think

Finally, there is a thought experiment that seems to lend the existence of a large number of universes plausible. In our universe, natural laws and constants of nature shape the course of events. One of the constants of nature are, for example, the mass of an electron, Planck's constant or the gravitational constant. The amazing thing is now that all the fundamental constants in our universe are so precise that a formation of stars, planets and life is even possible. If only one of the many constants of nature a little bit different, there would be no people who could think about multiverses.

Now you can either say: Wow, that's just a very cool coincidence that our universe has exactly the constants of nature that life is possible. Or they say: God has created the universe just so that it can enter the earth and the people. Friedman and his Russian colleagues Vitaly Vanchurin of the physics department at Stanford, however, would say: There is just so incredibly many universes, each with its own natural constants that the values can be simply viewed in our universe as a product of chance.

In many, many universes have at least one will be there, that the conditions for life offers. Perhaps there are so innumerable universes in which are applicable to all other laws - and also many in which life is not possible. So that would universes without an observer.

String theory as an argument for the multiverse theory

The followers of the multiverse theory provide yet another argument: the string theory accepted by many physicists. The states namely, that our universe is not just the us familiar

three dimensions of space, but of some more. Probably eleven. It could be so explained Vitaly Vanchurin that the other universes hide in the dimensions that are not accessible to us. "These universes are so disconnected from our universe," says Vanchurin. And yet they were somehow right next door. This is also an unusual, indeed scary thought.

Most researchers go so far assume that the us not accessible dimensions have contracted during the Big Bang to tiny units - much smaller than atoms. The new idea is considering the opposite: Maybe they bloated to parallel worlds. So if there are eleven dimensions of space, then so many different universes would also be conceivable only in accordance with? No, says Vanchurin. Considered one the workings of quantum physics, then the number of possible universes Multiply abruptly within string theory.

Unlimited universe

"In every moment, parallel universes could split off from ours," says Vanchurin. This resulted from the many opportunities that exist in the world of quantum physics for particles. When, for example, an electron between two states "decide" that this could lead to the birth of two new universes. That sounds very speculative. But Vanchurin says: "We can not perceive it, but know that it is possible due to the laws of quantum mechanics."

Our universe is probably infinite - and yet finite size. Just as the surface of a ball is limitless, but is geographically limited, even the universe could be curved into itself. Anyone flying in one direction long enough, would eventually back at the starting point of his journey.

This also applies to universes in a multiverse: Even if parallel worlds arise in every fraction of a second in countless dimensions whose number is limited. One would think that the number of universes is infinite, because the multiverse is unlimited. "Let's focus on the possibilities, the maximum since the beginning of time had been able to give, we get a finite number," calculates Vanchurin ago.

Limited information of human intake of

Finally, yes - but larger than anything humans can imagine. Each person can take in on average during his life 10^{16} bits of information - a one followed by 16 zeros. The Russian-American research team has calculated the number of possible universes in the multiverse is a number with 27 zeros.

Also the theory of cosmic inflation, according to which the universe has expanded shortly after the Big Bang faster than light could be an indication of other universes. Each experiment that inflation of the universe confirmed, also speaking on behalf of a multiverse, says Jason Gallicchio from the University of Chicago. He wants to study with colleagues away from the Kavli Institute for Cosmological Physics far from each other quasars. Quasars are "quasi-stellar objects" on the edge of the visible universe. They are a kind of visible black holes emit radiation. Because they are so far away, even the light has since the Big Bang nearly 15 billion years ago, has not had enough time to travel from one to another quasar.

Similarities to the present day

"Between the quasars may have occurred at any time to exchange information," says Gallicchio. Unless there had been a sudden expansion of the universe, and inflation. Then they could have had contact before. "In this case, should have been preserved some similarities to the present day," says the U.S. physicist.

And so Gallicchio want to look for such similarities, which then would be a testament to the

theory of inflation. Was there the phase of inflation, then it would turn unlikely that our universe should have been the only "cosmic bubble" that has spread. Whether all this also happens in a black hole - which is, however, in the stars.

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