Are black holes time machines?

Even though they cannot be used to travel to the past, they make travelling forward fast to the future possible. This is because time passes more slowly when you are close to a black hole.

Can we use our knowledge of General Relativity to travel to the stars?

General Relativity can be used to optimise rocket trajectories, but the technology to fold spacetime to create shortcuts is too far from the present. If humans ever learn how to manipulate space and time, General Relativity will be a crucial ingredient.

Can black holes be created by humans in a laboratory or particle accelerator?

Maybe. If it is possible, they would be microscopic and disappear very quickly. So they would not be dangerous for us.

Is this the whole story?

Are there other theories of gravity beyond General Relativity?

Modifying the laws of gravity on cosmological scales might explain some of the observations without introducing dark matter or dark energy. Many extensions of General Relativity are known and will be tested by future experiments.

Could we hear gravitational waves with our ears?

No, the actual waves that reach us are extremely weak, which means that we will never be able to hear them directly, even though their frequencies do indeed lie in the audible range.

Can we detect dark matter in a laboratory?

Maybe. There are several ongoing experiments trying to detect collisions between dark and ordinary matter. This would be the final evidence of the existence and nature of dark matter.

How much can gravitational waves tell us about the universe?

A lot. They are a completely new way to experience it. We will be able to hear what we cannot see: the beginning of the universe, the explosion of supernovae, the formation of black holes and many more phenomena hidden from our sight.

What happened during the first fractions of a second?

We still don't know how the universe originated or how the matter we observe today was created. However, we do have a theory (inflation) which satisfactorily predicts how the universe expanded incredibly fast from microscopic size to its present huge extent.

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