Theory and observations follow each other

The agreement between the measurements of the two teams was excellent, leading to the conclusion that the black hole at the centre of our galaxy should be equivalent to around 4 million solar masses, packed into a region the size of our solar system.

We may soon get a direct look at Sagittarius A*. This is next on the list because, just over a year ago, the Event Horizon Telescope astronomy network succeeded in imaging the closest surroundings of a supermassive black hole. Farthest in, in the galaxy known as Messier 87 (M87), 55 million light years from us, is a blacker than black eye surrounded by a ring of fire.

The black core of M87 is gigantic, more than one thousand times heavier than Sagittarius A*. The colliding black holes that caused the recently discovered gravitational waves were considerably lighter. Like black holes, gravitational waves existed only as calculations from Einstein's general theory of relativity, before being captured for the first time in the autumn of 2015, by the LIGO detector in the USA (Nobel Prize in Physics, 2017).

What we do not know

Roger Penrose showed that black holes are a direct consequence of the general theory of relativity but, in the infinitely strong gravity of the singularity, this theory ceases to apply. Intensive work is being conducted in the field of theoretical physics to create a new theory of quantum gravity. This must unite the two pillars of physics, the theory of relativity and quantum mechanics, which meet in the extreme interior of black holes.

At the same time, observations are coming closer to black holes. The pioneering work of Reinhard Genzel and Andrea Ghez has led the way for new generations of precise tests of the general theory of relativity and its most bizarre predictions. Most likely, these measurements will also be able to provide clues for new theoretical insights. The universe has many secrets and surprises left to be discovered.