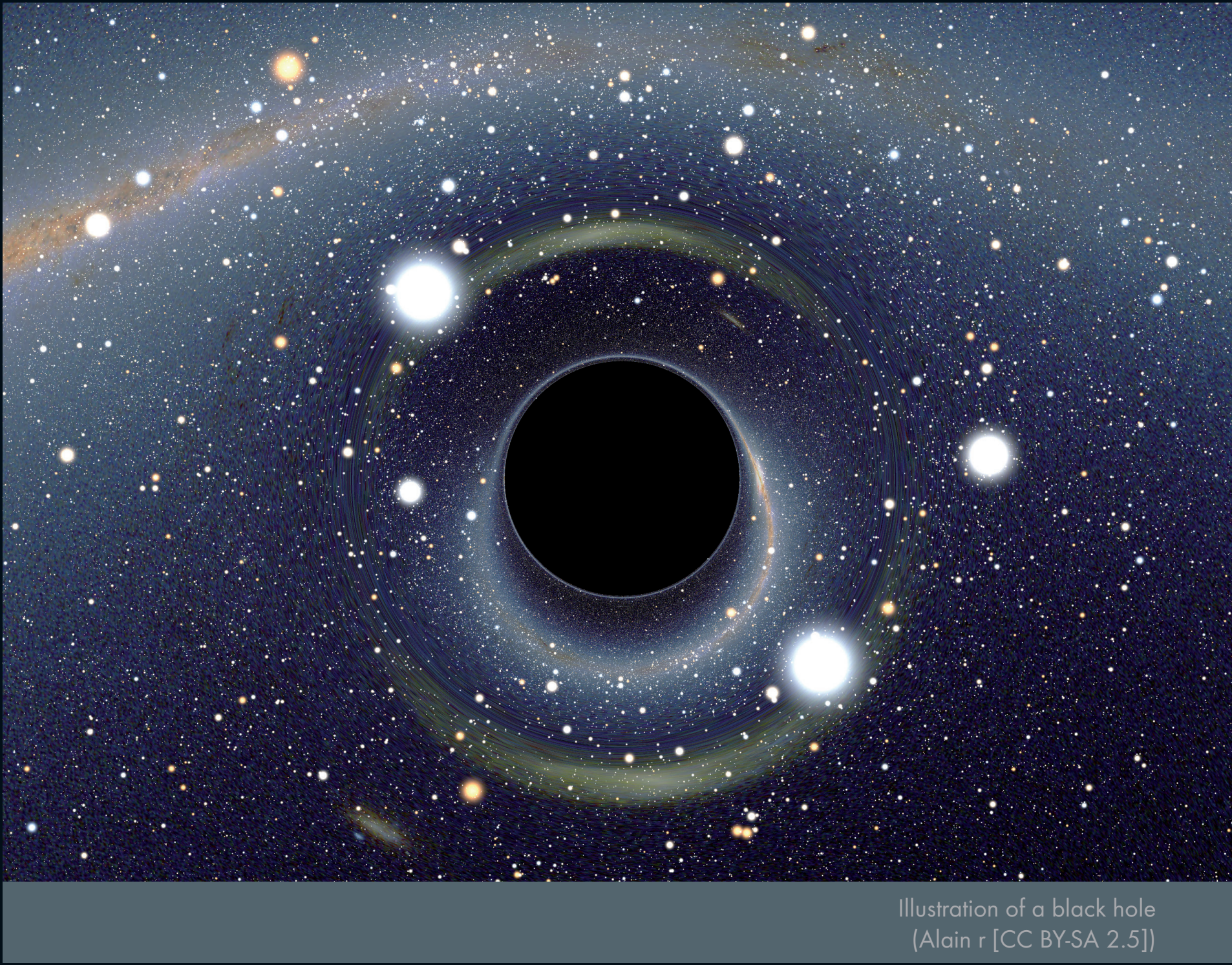


How do we know dark matter and dark energy exist?



Just like a person leaves footprints in the snow, every different sort of matter or energy leaves a particular (gravitational) footprint we can observe.

Do black holes form part of dark matter?



Black holes may contribute to dark matter, since they are massive and truly dark! Hence, they are natural candidates, but it is still unclear whether they can account for a significant fraction of the dark matter.

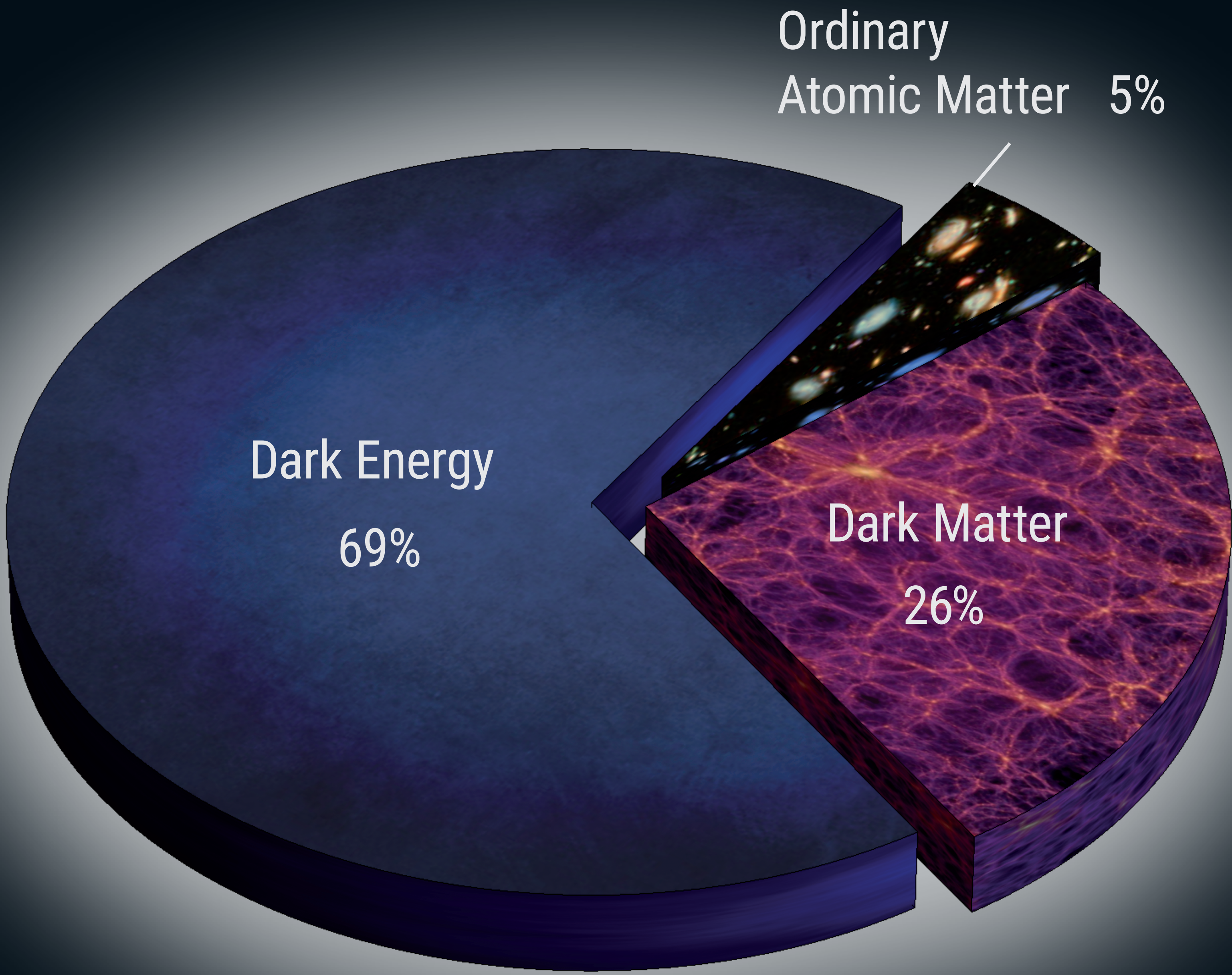
What you see is NOT all there is. Not even close!

The familiar world that surrounds us is mostly made of protons, neutrons and electrons. Combined into atoms, this is the material we are made of. It applies equally well to bacteria, apples, oceans, air, entire planets or even stars; everything we are familiar with.

However, such ordinary matter accounts for only a small fraction of the total matter in the universe! The remaining matter is invisible. This exotic form of matter is known as dark matter.

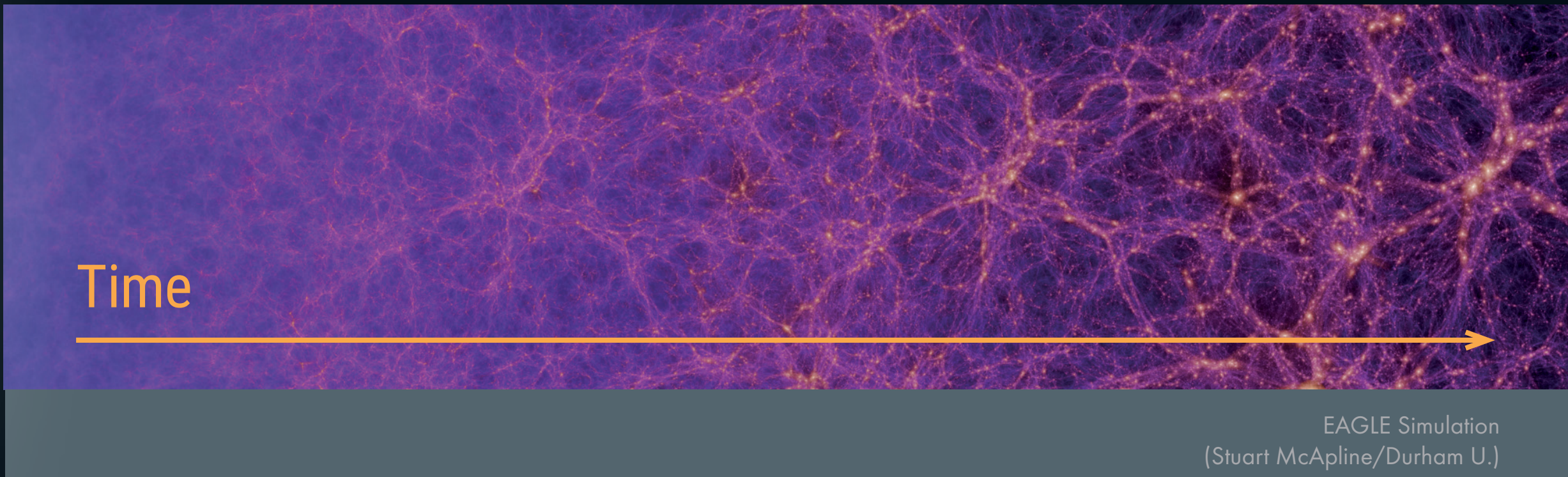
But there is more. Amazingly, most of the energy in the present cosmos (about 69%) does not even behave like matter! In contrast to ordinary matter, this mysterious component – called dark energy – is repulsive.

The many dark sides of the universe



Adding it all up, the visible universe accounts for less than 5% of the entire cosmos!

Pie chart (ICCUB, background: ordinary matter slice (NASA, ESA, G. Illingworth, D. Magee, and P. Oesch (California U., Santa Cruz), R. Bouwens (Leiden U.), and the HUDF09 Team)). Dark matter slice (Springel et al. (Virgo Consortium), Max-Planck-Institute for Astrophysics.)



Computer simulation of the evolution of dark matter over the age of the universe. The lighter the colour, the denser the dark matter.

Dark Energy

Dark energy is an enigmatic form of energy. Given that it fills the entire universe uniformly, and that its gravity tends to repel, it plays a major role in cosmic evolution. It provides the simplest explanation for the accelerated expansion of the universe. Dark energy is one of the greatest mysteries in modern science.

Dark Matter

Dark matter remains an unidentified form of invisible matter. It naturally clumps together and forms an evolving cosmic web which is responsible for the formation of the galaxies and clusters we see. One possibility is that dark matter is made of unknown particles that hardly interact with ordinary matter, and mostly through their gravitational attraction.

