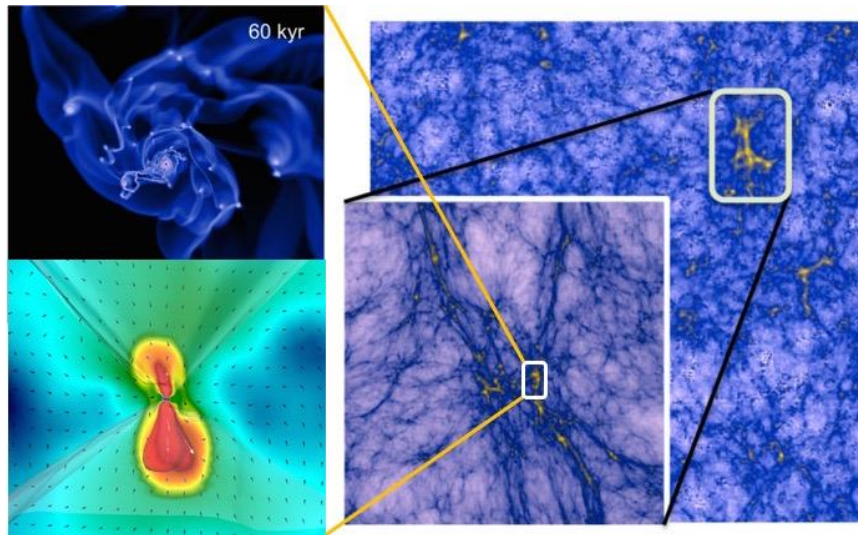


What are the first objects in the universe?

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<https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNldz09>



Uncovering the nature of the very first objects born in the universe is a frontier of modern astrophysics. For decades, this has been mainly led by theoretical studies, but recently the James Webb Space Telescope (JWST) has been exploring the early cosmic age, less than a billion years after the Big Bang, which has only been considered by theorists. In this talk, I will review recent developments, in particular, what the first stars, galaxies and black holes in the universe were, and what theoretical studies, in particular numerical simulations, predict about their birth. In brief, the current framework predicts that the first stars should typically have been much more massive than the Sun and that such massive stars may have been in a greater majority than in the present-day universe. Since some of these massive stars give birth to massive black holes when they die, it is very likely that the early universe was also filled with many heavy black holes. The universe filled with such massive objects must have been different from the present-day universe. The more we extend our observations deep into the early universe, the more "signatures" of such an inaccessible universe may emerge. I will also include such future prospects in the last part of my talk.