# Supermassive black holes from supermassive stars

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The origin of the supermassive black holes that are now found and believed to be present in most galaxies is a long-standing question. The discovery of high-redshift quasars that require the presence of such supermassive black holes when the universe was less than a billion years old poses a particular challenge to our understanding of how such black holes are formed, or can grow to such size in the very limited time since the big bang. It is obvious that what would help a lot to get big is to start big.

One possible scenario to make supermassive black holes is to start with supermassive stars that then collapse to supermassive black holes of up to a million solar masses. In recent years, a cosmological scenario within the formation of the first stars and first galaxies has been established that may allow the formation of such supermassive stars by the rapid accretion of matter. Galaxy collisions may also offer conditions that could lead to the formation of supermassive stars in a similar way.

We aim to present models of supermassive stars and their fates that explore the sensitivity of these final fates of supermassive stars to physical properties such as initial mass and metalicity, as well as physical uncertainties such as nuclear reaction rates. We discuss the impacts on which of these stars make black holes directly, which may first undergo phases of stable nuclear burning, or which of them may even explode.