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Quasars at the dawn of cosmic time (INVITED)

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Quasars at z>6 (age of the Universe: <1 Gyr) are arguably the most active astrophysical objects in the early universe. They are powered by fast accretion on their central black holes (which already have masses of 0.1-10 billion Msun). Their galaxies form stars at rates of >100 Msun/yr, and, despite the young cosmic age, they appear chemically enriched. These humongous star formation and accretion rates are fueled by immense gaseous reservoirs. Here we review how to the quasar redshift frontier has been pushed forward. We discuss the lessons learned on the formation and early growth of massive black holes, on their host galaxies, their environment, and on the intergalactic medium at the end of reionization. In particular, we demonstrate how observations at (sub-)mm wavelengths can shed light, for the first time, on the mass, spatial extent, chemistry, kinematics, and physical properties of the interstellar medium in these quasars, thus constraining the build up of the first massive galaxies and black holes and the AGN impact on their gas, and testing the interstellar medium properties in regimes that are not observable anywhere else in the universe.

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