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How the first generations of luminous baryons established the X-ray and UV backgrounds

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I will discuss how the first generations of astrophysical objects made a substantial impact on our Universe though their radiation. Due to their large mean free paths, X-rays from the first sources likely quickly heated the IGM. The 2nd generation of 21cm instruments can provide a unique view into these early epoch. The early stages of reionization likely followed, driven by so-called "mini-halos", i.e. molecularly-cooled halos. These small halos are susceptible to complex feedback mechanisms, especially from the soft-UV background which preceded reionization, likely resulting in complex and extended early stages of reionization. When atomically cooled halos emerged as the dominant ionizers, reionization could proceed fairly rapidly, with these being less sensitive to radiative feedback than previously thought. Reionization could have slowed in the final stages when the ionized bubbles grew larger than the separation of absorption systems. The final stages likely involved the (fairly slow) photo-evaporation of Lyman limit systems, which by then regulated the rise of the UV background. I will discuss the theoretical underpinnings of this narrative, as well as how future observations may help shed light on the outstanding uncertainties.

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