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Mapping the baryonic Universe: a new window into the cosmos

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The evolution of the baryonic (normal) matter in the Universe is an excellent probe of the formation of cosmic structures and the evolution of galaxies. Over the last decade, considerable effort has gone into investigating the nature of baryonic material, theoretically and observationally. The technique of intensity mapping (IM), which measures the integrated emission from sources over a broad range of frequencies, is a promising probe of cosmological baryons. A particular advantage of IM is that it provides a tomographic, or three-dimensional picture of the Universe, unlocking significantly more information than available from traditional galaxy surveys. Astrophysical uncertainties, however, constitute an important systematic in our attempts to constrain cosmology with IM. I describe an innovative approach which allows us to fully utilize our current knowledge of astrophysics in order to develop cosmological forecasts from IM. Extensions of this model pave the way towards a comprehensive understanding of molecular gas evolution, allowing us to interpret results from upcoming surveys. This opens up the exciting potential of constraining physics beyond the Λ CDM model from future IM observations.

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