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EoR, Cosmic Dawn and the SKA

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The first billion years of cosmic history is still essentially uncharted territory, and promises an enticing range of scientific discovery once its frontiers have been breached. After the well-studied epoch of recombination, three major distinct phases of cosmological evolution occur: the so-called Dark Ages which witness the widespread collapse from pristine linearity via dark-matter dominated halo growth, the Cosmic Dawn in which the first luminous sources awaken, and finally the Epoch of Reionisation (EOR) in which the inter-galactic hydrogen is ultimately ionised. The luminous sources from these epochs are being targeted by advanced space telescopes, like JWST, but these are limited to the highly-biased sample of very brightest sources. The SKA will play an absolutely pivotal role in transforming our understanding of the first billion years, by mapping the integrated contribution of all thermal processes over the vast 3D cosmic lightcone, via the 21cm spectral line of neutral hydrogen.

In this talk, I will give an overview of the exciting science awaiting us once we unlock this treasure trove of information. I will also outline the many significant challenges that obstruct this goal, as well as recent advancements and lessons learned from international “pathfinder” experiments that have made great progress towards overcoming these challenges. Finally, I will look to the future, summarizing the prospects for the SKA and the many synergies between the SKA and other probes of Cosmic Dawn.

Research area

Epoch of Reionization

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Session Classification: Plenary - Scientific Highlights on the Pathway to the SKAO