Searching for the first stars and, more generally, for the first generations of galaxies that might have hosted them, is a primary function for many current and future telescopes. Knowledge of the first stars would shed light on our origins, and allow researchers to refine the Big Bang model. Over the past decade, we have witnessed remarkable progress in the discovery of ever more distant galaxies, with the record-holder updated almost monthly. Deep images from the Hubble Space Telescope's infrared camera WFC3 — which has exquisite sensitivity and a relatively wide field of view — routinely reveal[9,10] candidate galaxies at early cosmic epochs. And, whenever possible, these candidates are subsequently confirmed using spectroscopic observations.

However, there is evidence to suggest that the observed, early-epoch galaxies alone could not have provided the radiation that was required to 'reionize' hydrogen atoms, an event that was complete by about 1 billion years after the Big Bang[11,12]. It is therefore possible that astronomers are observing only the most luminous objects in an underlying population of faint galaxies.

How can this hypothesis be tested? This is where the collective infrared light from cosmic sources, or the cosmic infrared background (CIB), comes in. Measurements of the CIB intensity, or more precisely its fluctuations, could potentially be used to detect the combined emissions from a population of faint galaxies. Even after removal of the infrared light from known galaxies, the CIB intensity is not perfectly uniform across the sky: it shows fluctuations in different directions of about 10% around the mean, indicating that the underlying sources of the signal gather into clusters. The degree to which these sources cluster as a function of their angular separation on the sky is encoded in a mathematical quantity known as the angular power spectrum. However, the CIB intensity is contaminated by sunlight reflected by local interplanetary dust in the Solar System — the zodiacal light. The detection of a faint-galaxy population from CIB fluctuation measurements is therefore dependent on the accurate subtraction of this light.

Previous high-resolution infrared images taken with the Spitzer Space Telescope[13,14] and the AKARI satellite[15] have made it possible to measure such fluctuations and to subtract the contribution of the zodiacal light reliably. These observations have revealed that the angular power spectrum, and thus the clustering strength, increases towards large angular distances on the sky, up to one degree. This increase cannot be accounted for solely by the light produced by known galaxies[16].

In their study, Cooray *et al.* analyse recent deep images from Spitzer and detect the same increase in clustering strength. What's more, they demonstrate that the increase cannot be explained by either of two existing hypotheses — one based on a contribution from a population of faint, distant galaxies during the cosmic 'reionization' epoch[17–20], and another that invokes dwarf galaxies at intermediate distances from Earth. Intriguingly, however, the shape of the power spectrum is consistent with the distant-galaxy hypothesis.

What, then, is producing these large-scale CIB fluctuations? Cooray and colleagues propose that the source of this signal is light from intrahalo stars of known galaxies — that is, stars that have been stripped from the main body of their parent galaxies and cast into the galaxies' dark-matter haloes during galaxy collisions (Fig. 1). As interesting and plausible as it is, this explanation is based heavily on the poorly understood abundance and spectral energy distribution of intrahalo stars. In contrast to the distant-galaxy hypothesis, this model also predicts fluctuations induced by intrahalo stars in the visible part of the electromagnetic spectrum, in which the light from the first galaxies is blanketed by intervening intergalactic neutral hydrogen.

It will be interesting to see whether the authors' proposal stands up to scrutiny. However, the most exciting endeavour will be to isolate the CIB signal produced by the faint, reionizing galaxies and thereby make them amenable to study. Because this signal is buried under the putative signal of the intrahalo stars, it will be necessary to accurately remove this 'foreground' before that goal can be attained. ■

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