

Truth in advertising

It used to be said that cosmologists were frequently wrong, but never in doubt. That's supposed to have changed now cosmology has become a precision science. Certainly the remarkable data on the cosmic microwave background (CMB) radiation have provided us with a powerful way to explore and constrain fundamental parameters in physics and cosmology.

Many years ago, a colleague argued cogently to me for a theorem of observational cosmology — that it would always be impossible to measure fundamental parameters, such as the Hubble constant, because astrophysical systematic uncertainties would always creep in to overwhelm any clear determination. Thankfully, that has changed. Many new observables,

including measures of the large-scale clustering of matter, combine to give a stable, often precise, determination of such quantities as the flatness of the Universe and the density of baryons.

But we should not get carried away. For example, one hears that the third year of data from the Wilkinson Microwave Anisotropy Probe (WMAP), provides “stunning” support for inflationary cosmology. Journalists may need to elicit hyperbole from scientists to sell magazines, but the new power spectrum constraints from the CMB alone are similar to the old constraints from combining CMB data with other data involving large-scale structure.

We must also remember that some results are wrong. The



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significant shift between the first and third year WMAP data in the inferred epoch of re-ionization, when the first stars presumably formed, is one such example.

Current observations are far from finalizing our cosmological paradigms — there is still no unambiguous test of inflation, for example. Meanwhile, the detection of non-zero neutrino masses unleashed a new set of possibilities that might change our understanding of phenomena in the early Universe.

In short, it is possible to celebrate the richness and power of our new windows on the Universe without acting so much like, well, cosmologists!

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