Thursday, 25.06.2020				
Time UTC	Time CEST	Speaker	Subject	
12:50 - 13:00	14:50 - 15:00		Announcements	
13:00 - 13:25	15:00 - 15:25	Hendrik Hildebrandt	Weak gravitational lensing	Q&A
13:25 - 13:50	15:25 - 15:50	Nathalie Palanque-Delabrouille	Baryon Acoustic Oscillations with DESI	Q&A
13:50 - 14:15	15:50 - 16:15	Julien Lesgourgues	The sound horizon from Big Bang Nucleosynthesis	Q&A
14:15 - 14:40	16:15 - 16:40	Vivian Poulin	Theoretical explanations/solutions	Q&A
14:40 - 15:10	16:40 - 17:10	Panelists & speakers	Discussion	Q&A
		Panelists: P. Lemos, M. Colless, N. G. Sanchez, L. Pogosian		
		Link to YouTube Video		

13 Hendrik Hildebrandt - Weak Lensing

✍ There are already 5 questions with 13 upvotes. Here are the most popular ones:

Redshift surveys are flux limited and do not include all galaxies along the line of sight (eg dwarf and LSB galaxies). What is the implied level of systematics?

by David Valls-Gabaud | 5 upvotes

- ***Hendrik Hildebrandt*** *Jun 25th at 3:42 PM*

A: This is very actively studied at the moment. It is true that spec-z surveys are incomplete, deliberately (e.g. colour pre-selection) or by "accident" (not all redshifts could be measured). This is accounted for in the analysis via a re-weighting technique. How well this re-weighting works depends on the spec-z samples, number of bands to measure densities of calibration and target samples, photometric noise, etc. All of this is simulated at great detail with mock catalogues like MICE, Buzzard, etc. At the moment, we can calibrate mean redshifts for the bins used in the measurement at the ~0.01 level according to these simulations.

Is there a sigma8 tension also with WMAP as well? or only with Planck results?

by Behnam Javanmardi (Paris Obs.) | 4 upvotes

- ***Hendrik Hildebrandt*** *Jun 25th at 3:42 PM*

A: No, WMAP is fully consistent with pretty much all lensing measurements. However, the S8 precision of WMAP (and probably also its accuracy) is so much lower than Planck that I'm not sure if this should count as a strong argument.

What is the difference in area on the sky of these three cosmic shear surveys, between e.g., DES and KiDS?

by Taylor Hoyt (UChicago) | 3 upvotes

- **Hendrik Hildebrandt** Jun 25th at 3:42 PM

A: The analyses that I've shown are based on ~130, ~450, and ~1000 sq. deg. for HSC, KiDS, and DES, respectively. The final areas will be ~1300 sq. deg. for HSC and KiDS and ~5000 sq. deg. for DES. The statistical power, however, does not just depend on area but also on galaxy number density and - maybe most importantly - on redshift.

- **Rachael Beaton** 14 days ago

@Taylor Hoyt

- **Taylor Hoyt** 14 days ago

Thank you!

What are the astrophysics you swept under the rug that worry you the most in terms of biases? At what level?

by Richard Anderson (ESO) | 1 upvote

- **Hendrik Hildebrandt** Jun 25th at 3:45 PM

A: Estimating the non-linear dark matter power spectrum at better than percent precision is tough. Even worse, baryon feedback is quite uncertain at the moment. However, it was only swept under the rug in my talk but not in the analyses that I presented. Gaining better knowledge of these effects would results in tighter priors on the nuisance parameters that we have to marginalise over and hence tighter cosmological constraints. @Richard

- **Richard** 13 days ago

Thanks a lot @Hendrik Hildebrandt!

Are constraints on S8 marginalised over h, when you compare different data sets?

by Valeria | No upvotes

- **Hendrik Hildebrandt** Jun 25th at 3:46 PM

A: Yes, they are. We use a broad prior that encompasses Planck as well as SH0ES. However, while Omega_m and sigma_8 are sensitive on the h prior, S8 is pretty insensitive. You basically move along the banana if you change h. @Valeria Pettorino

- **Valeria Pettorino** 14 days ago

thanks @Hendrik Hildebrandt!

14 Nathalie Palanque-Delabrouille - BAO with DESI

✍️ There are already 4 questions with 5 upvotes. Here are the most popular ones:

What do you see as the main systematics of incorporating BBN?
by Anonymous | 3 upvotes

- **Palnque-Delabrouille** 4:28 PM
  A: The systematics related to incorporating BBN are those intrinsic to the BBN estimate of Omega_b. One of the main sources of systematic in this Omega_b measurement comes from the cross-sections of the reactions happening in BBN. Theoretical prediction give ~1% predictions but current laboratory experiments have uncertainties at the level of ~7% [see Cuceu et al. 2019 for a short review]

Will DESI be measuring H(z) in a blinded way?
by Alex Hall | 2 upvotes

- **Palnque-Delabrouille** 4:28 PM
  A: Yes. Absolutely. DESI has a very stringent blinding strategy that will be applied to all analyses of DESI data.

What are the chances DESI will see an unexpected form of H(z)?
by Anonymous | No upvotes

- **Palnque-Delabrouille** 4:28 PM

  A: Current measurements of H(z) are at the ~5-10% level. DESI aims at a factor ~5 improvement. Any unexpected shape of H(z) within this difference could be detected by DESI.

Would it be fair to say that DESI/BAO will measure the shape of H(z), rather than H0, since it does not provide an independent physical scale?
by Anonymous | No upvotes

- **Palnque-Delabrouille** 4:28 PM

A: Yes, BAO measures the shape of H(z) independently of any external data set. BAO provides more than the shape, however, since it also measures the ratio of the sound horizon r_s to H(z). Hence provided a value for r_s, BAO calibrates the amplitude of H(z). And that yields a measure of H0 since the large redshift lever arm breaks the degeneracy between H0 and Omega_m(z)

15 Julien Lesgourgues - The sound horizon from BBN

✍️ There are already 3 questions with 7 upvotes. Here are the most popular ones:

Does he consider the Li discrepancy settled?
by Anonymous | 4 upvotes

- **Julien Lesgourgues** 9:58 AM

  Dear anonymous, who do you mean by "he"? Not God I presume? I cannot answer for him, but I can answer for me - hoping you will give at least as much credit to the answer. One or two decades ago, astrophysicists thought that by looking at "clean" regions of the universe, one could measure the primordial abundance of several light elements (H, D, He, Li and even more). They progressively realised that this is possible for H, D and He (and even there, it is complicated, there are many subtleties, you need to some extrapolations), but not for Lithium, unlike previously thought. Lithium can be both ***destroyed*** *and* ***created*** *by stars, so it's really difficult to get even an upper or lower bound on the primordial Lithium fraction. As fars as I know, most experts have lost faith in the relevance of the Lithium abundance measurement for the study of BBN - at least, my BBN friends have. They just focus on D/H and*

He/H. In other way, it seems that there is no theoretical Lithium problem, just an observational one.

What is the H0-OmegaM degeneracy when combining BBN with Alcock-Pacynski test measurements of OmegaM (instead of full shape/cosmic shear)?
by Anonymous | 3 upvotes

- **Julien Lesgourgues** 10:31 AM
  Dear anonymous, I am not very expert on this and somebody in the discussion may wish to bring up some references. As fars as I know from, e.g., https://arxiv.org/pdf/1909.05277.pdf, with current data, the Alcock-Pacynski test measurements of OmegaM are not very sensitive and bring very little information compared to full shape measurements. (edited)

in the several solutions you discussed to keep theta fixed while increasing h, why we cannot reduce c_s? Is there any space on c_s given the BBN measurements?
by Anonymous | No upvotes

- **Julien Lesgourgues** 10:21 AM
  *Dear Anonymous, the formula for c_s is very simple: c_s=1/3/(1+3rho_b/4rho_gamma)=1/3/(1+(...)omega_b/omega_photons*a). This comes just from assuming that photons are ultra-relativistic, baryons are non-relativistic, and that the two species form a fluid. So the standard model does not "fix" c_s, the sound speed is actually a function of the scale factor a and of the parameter omega_b/omega_gamma. Varying omega_b/omega_gamma within the range allowed by BBN data, or CMB data, or other probes, does not allow you to change c_s by a large amount and solve the Hubble tension.*
  I don't think that you want to assume that photons have a mass >1eV, or that protons have a mass <1eV, so you cannot put in question the assumptions above. I think that one way to change c_s would be to assume that photons and baryons form a fluid together with a third exotic species, with which they would have exotic interactions. We would then have to take this species into account when computing the (delta pressure)/(delta density) of the full fluid. However, the result would change significantly only if the the third species had a significant background density. So, a priori, it would change lots of things in the

background and perturbation evolution. For instance, you could assume that baryons and photons are strongly coupled to DM... but then DM perturbations would have a very different evolution prior to photons decoupling, and the CMB and LSS spectra would look completely different.
In summary, my answer is no, I don't see any easy and reasonable way to change the expression for c_s without going into enormous trouble and complications! If somebody has a not-too-ugly idea, let me know! (edited)

- **Lloyd Knox** 13 days ago

excellent answer, Julien. I would further add that we are fairly directly sensitive to c_s -- the resulting offset to zero point of the acoustic oscillations because c_s is not equalt to 1/3 leads to the odd-even peak height modulatoin and is the origin of our dominant means for constrainging the baryon-to-photon ratio -- a constraint tha tis consistent with BBN inferences.

16 Vivian Poulin - Theoretical solutions

✍️ There are already 2 questions with 2 upvotes. Here are the most popular ones:

Can an early universe component without radiation-like equation of state
by Anonymous | *2 upvotes*

- **Vivian Poulin** 9:58 AM

  yes; the equation of state must be somewhere between that of radiation and that of a kinetic energy dominated scalar field (i.e., 1/3<w<1)

How much can you reduce the tension between Planck(flat LCDM) and SH0ES by introducing EDE ?
by Anonymous | *No upvotes*

- **Vivian Poulin** 9:58 AM

The first part of the answer is that, in a combined analysis, the bestfit EDE has H0 ~ 73, while the fit to Planck is unchanged when compared to that of the bestfit LCDM on Planck Only (the fit to Planck is improved when compared to the global fit, but that is somewhat artificial since the SH0ES likelihood pulls away from the bestfit LCDM), showing that the tension can be potentially fully relieved.
However in a `Planck Only’ analysis, the answer depends on the choice of prior for the EDE because, within Planck, the EDE solution is degenerate with LCDM. As such, part of the constraints are driven by how one chooses to explore the parameter space. If you

only leave the phenomenological parameter free to vary (f_ede(zc), zc, theta_i), the tension is only mildly relieved. However, we argue that this is because, once f_ede(zc) ~= 0, any choice of zc and theta_i is effectively equivalent to LCDM (btw this shows that the real number of degree of freedom in the model is not 3), such that the constraints on fEDE are strong, eventhough the chi^2 is almost flat all the way to H0~73.
But once zc & theta_i are fixed (one might know them from its theory a priori), the degeneracy clearly appear and Planck itself (i.e. not including the prior on SH0ES) actually shows a mild preference for fEDE > 0 at ~2sigma (Delta chi^2 of -5 vs LCDM for 1 free param). In that case, the Planck Only analysis shows ~1.5sigma (tension? agreement? with SH0ES).
The catch however is that in this exercise we have ignored the `S8' data. the simple EDE model we play with exploit a degeneracy with om_cdm to compensate the effect of the decay of the gravitational potential on CMB data (+some effect on n_s to compensate the different silk damping scale). This leads to a higher S8, which increases the tension with cosmic shear data. These data could constrain the EDE but one has to be careful in combining Planck with these are they are potentially not statistically compatible. The resolution of the tension might lie elsewhere (other new physics? systematics?). But at face value, it does restrict the success of the EDE. (edited)

Discussion Panel 4

✍️ There are already 3 questions with 18 upvotes. Here are the most popular ones:

What would changing big G do for the problem?

by Anonymous | *10 upvotes*

- **Levon Pogosian** 14 days ago

The varying G possibility was considered recently in this paper: https://arxiv.org/abs/2004.11161

arXiv.org

A larger value for H_0 by an evolving gravitational constant

We provide further evidence that a massless cosmological scalar field with a non-minimal coupling to the Ricci curvature of the type $M^2_{\rm pl}(1+ξ σ^n/M_{\rm pl}^n) $ alleviates the...

with CMB we have known physics, with SN1a we have no 3D

by Anonymous | *8 upvotes*

What about changing the speed of light?

by Anonymous | *No upvotes*