



The Milky Way Panorama Credit: ESO / S. Brunier

## Newsletter of *A Cosmology Group* - May 2023

### ACG Editorials

“This is a truly historic paper” posted Eric Lerner on the forum, commenting on a paper just posted as a preprint on [arXiv:2305.00268](https://arxiv.org/abs/2305.00268): “**Cosmic Microwave Background anomalies explained: a strong impact of nearby galaxies on observed CMB large scale fluctuations**” The paper shows that “A systematic decrease in Cosmic Microwave Background (CMB) temperatures around nearby large spiral galaxies points to an unknown interaction with CMB photons in a sphere up to several projected Mpc around these galaxies.” As a result, “the largest scales of the CMB seem strongly contaminated. This could pose a significant problem for the interpretation of the CMB power spectrum, since the lowest multipoles will become even smaller after correcting for the foreground component. It is difficult to see how a very low large-scale power spectrum can be consistent with the standard  $\Lambda$ CDM model. We have furthermore shown that the correlations extend to smaller scales and may significantly alter the power spectrum also at these scales” *and every cosmological parameters derived from it!*

Moreover, “A detailed modelling of the foreground is difficult to account for, since the nature of the CMB photon interaction with material associated to galaxies is unknown,” but “the signal almost vanishes when we use more distant galaxies.” This is consistent with a local CMB that is generated within 100 Mpc from us, not as the remnant heat left over from the Big Bang.

Now, how long will it take for someone to *seriously* suggest that dark matter is involved in the unknown photon interaction?

In a series of articles Adam Frank discusses some questions raised by Fulvio Melia (see reference under *Cosmology*, below). In Frank’s article “Our best models of the Universe have a troubled past” [bigthink.com/13-8/the-past-hypothesis-universe/](https://bigthink.com/13-8/the-past-hypothesis-universe/)), we read “Based on probability alone, ... the Universe should have started in a state that was either already in equilibrium or close to it. ... Somehow, our Universe must have avoided all those high entropy states and started in a very unlikely, very low entropy state. Physicists and philosophers call this the *past hypothesis*. ... A bigger question is whether any cosmological model could solve the need for a past hypothesis. What would a natural solution to the question of initial cosmic conditions, one without any fine tuning or special pleading, look like? If a new model could solve this conundrum, it would indeed deliver a powerful argument for going in a new direction.”

As plain as the nose on Adam Frank’s face, a static cosmology does not have any initial condition and has no need for a “past hypothesis”. But cosmologists don’t see this natural solution because they are blinded by the incorrect idea that “the universe is a closed system”. Like Sisyphus, they repeatedly push the second law of thermodynamics on to the universe just to see their effort fall into another conundrum.

In this Newsletter: The CMB is not the remnant heat left over from the Big Bang, Riess *et al.* continue to refine the Hubble constant, sudden increase of the amount of warm carbon in the “early universe”, interesting questions about cosmology, ... and a tiny galaxy at redshift  $z = 9.5$ , with a 16 parsec radius and 40 million stars!

Thanks to Jim Baggot, Eric Lerner and all who contributed references to papers.

Louis Marmet, May 3, 2023  
[redshift@cosmology.info](mailto:redshift@cosmology.info)

# Reviewed Publications<sup>1</sup>

## - Redshift, Hubble parameter, Expansion

“**CATS: The Hubble Constant from Standardized TRGB and Type Ia Supernova Measurements**” D. Scolnic, A. G. Riess *et al.* (Submitted to ApJL) [arXiv:2304.06693](https://arxiv.org/abs/2304.06693) (2023-4-13) “The Tip of the Red Giant Branch (TRGB) provides a luminous standard candle for constructing distance ladders to measure the Hubble constant. In practice its measurements via edge-detection response (EDR) are complicated by the apparent fuzziness of the tip and the multi-peak landscape of the EDR. As a result, it can be difficult to replicate due to a case-by-case measurement process. Previously we optimized an unsupervised algorithm, Comparative Analysis of TRGBs (CATs), to minimize the variance among multiple halo fields per host without reliance on individualized choices. Here, we apply this algorithm to an expanded sample of SN Ia hosts to standardize these to multiple fields in the geometric anchor, NGC 4258. In concert with the Pantheon+ SN Ia sample, this analysis produces a (baseline) result of  $H_0 = 73.22 \pm 2.06$  km/s/Mpc. The largest difference in  $H_0$  between this and similar studies employing the TRGB derives from corrections for SN survey differences and local flows used in most recent SN Ia compilations but which were absent in earlier studies. We employ a grid of 108 variants around the optimal TRGB algorithm and find the median of variants is  $72.94 \pm 1.98$  km/s/Mpc with an additional uncertainty due to algorithm choices of 0.83 km/s/Mpc. None of these TRGB variants result in  $H_0$  less than 71.6 km/s/Mpc.”

“**A 0.9% calibration of the Galactic Cepheid luminosity scale based on Gaia DR3 data of open clusters and Cepheids**” M. Cruz Reyes, R.I. Anderson, A&A **672** doi: [10.1051/0004-6361/202244775](https://doi.org/10.1051/0004-6361/202244775) (2023-4) “We have conducted a search for open clusters in the vicinity of classical Galactic Cepheids based on high-quality astrometry from the third data release of the ESA mission Gaia to improve the calibration of the Leavitt law. Our approach requires no prior knowledge of existing clusters, allowing us to both detect new host clusters and cross-check previously reported associations. The most direct comparison of our results with the SH0ES distance ladder yields excellent ( $0.3\sigma$ ) agreement for both the absolute magnitude of a 10 d solar metallicity Cepheid in the near-IR HST Wesenheit magnitudes and the residual parallax offset. Despite the use of a common set of photometry, this is an important cross-check of the recent Hubble constant measurement by Riess *et al.* based on independently determined cluster membership and average parallaxes. These results mark the currently most accurate absolute calibrations of the Cepheid luminosity scale based purely on observations of Milky Way Cepheids, and it is also the most precise determination of the residual Cepheid parallax offset at a significance of  $6 - 7\sigma$ .”

## - Microwave [and other] Background

“**Cosmic Microwave Background anomalies explained: a strong impact of nearby galaxies on observed CMB large scale fluctuations**” F.K. Hansen *et al.* [arXiv:2305.00268](https://arxiv.org/abs/2305.00268) (2023-5-2) “In Luparello *et al.* 2023, a new and hitherto unknown CMB foreground was detected. A systematic decrease in Cosmic Microwave Background (CMB) temperatures around nearby large spiral galaxies points to an unknown interaction with CMB photons in a sphere up to several projected Mpc around these galaxies. Conclusions. The largest scales of the CMB and thereby the cosmological parameters, may have important changes after proper corrections of this foreground component. However, reliable CMB corrected maps can only be derived when suitable physical mechanisms are proposed and tested.”

“**The cosmic shallows I: interaction of CMB photons in extended galaxy halos**” [arXiv:2206.14217](https://arxiv.org/abs/2206.14217) [Submitted on 28 Jun 2022] H.E. Luparello *et al.* “We report and analyse the presence of foregrounds in the Cosmic Microwave Background radiation associated to extended galactic halos.”

Related DOI: <https://doi.org/10.1093/mnras/stac3491>

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<sup>1</sup>For all reviews, quoted text is adapted from the original, underlined text is my emphasis, and *italicized text are my comments*.

## - Nucleosynthesis

**“Examining the decline in the CIV content of the universe over  $4.3 \leq z \leq 6.3$  using the E-XQR-30 sample”** R.L. Davies *et al.* MNRAS **521**, 1, p. 314 doi: [10.1093/mnras/stad294](https://doi.org/10.1093/mnras/stad294) (2023-3-7) “The study shows the amount of warm carbon suddenly increased by a factor of five over a period of only 300 million years – the blink of an eye in astronomical timescales.” [astro3d.org.au/tracing-13-billion-years-of-history-by-the-light-of-ancient-quasars/](https://astro3d.org.au/tracing-13-billion-years-of-history-by-the-light-of-ancient-quasars/) *The distorted scale used on the figure of this article is indicative of how Big Bang cosmologists have to distort the time scale to fit data.*

## - Galaxy and Large-Scale Structure Formation

**“Pointlike Sources among  $z > 11$  Galaxy Candidates: Contaminants due to Supernovae at High Redshifts?”** H. Yan *et al.* ApJL **947** 1, p. L1 doi: [10.3847/2041-8213/acc93f](https://doi.org/10.3847/2041-8213/acc93f), arXiv:2301.09614 (2023-4) “The recent searches for  $z > 11$  galaxies using the JWST have resulted in an unexpectedly high number of candidate objects, which imply at least 1 order of magnitude higher number density of  $z > 11$  galaxies than the previously favored predictions. [...] We find that such sources might indeed be new kinds of contaminants to high- $z$  candidate samples: these could be SNe at various redshifts. This alleviates the tension but does not eliminate it, as there are plenty of non-point-source objects in the  $z > 11$  candidate samples published to date. Ironically, the existence of supernovae at  $z > 10$  would still imply that the previously favored picture of early galaxy formation severely underestimates the global star formation rate density [at] such redshifts.”

**“A magnified compact galaxy at redshift 9.51 with strong nebular emission lines”** H. Williams *et al.* Science doi: [10.1126/science.adf5307](https://doi.org/10.1126/science.adf5307) (2023-4-13) “... The galaxy has a radius of 16 parsecs” and  $\log(m_*/M_\odot) = 7.6$  “The oxygen abundance is  $12+\log(\text{O}/\text{H}) = 7.48$ , ... which is consistent with the mass-metallicity relation observed in the local Universe for similar-mass galaxies” “... it is unlikely that the  $z = 9.51$  galaxy hosts an AGN.”

**“Observational Evidence for Large-scale Gas Heating in a Galaxy Protocluster at  $z = 2.30$ ”** C. Dong *et al.* The Astrophysical Journal Letters **945** Number 2, L28 (2023-3-14) doi [10.3847/2041-8213/acba89](https://doi.org/10.3847/2041-8213/acba89) “We report a  $z = 2.30$  galaxy protocluster COSTCO-I where the Ly $\alpha$  forest does not show significant absorption. This departs from the transmission–density relationship (often dubbed the fluctuating Gunn–Peterson approximation; FGPA) usually expected to hold at this epoch, which would lead one to predict strong Ly $\alpha$  absorption at the overdensity. [...] the large-scale gas associated with COSTCO-I is being heated above the expectations of the FGPA, which might be due to either large-scale AGN jet feedback or early gravitational shock heating. COSTCO-I is the first known large-scale region of the IGM that is observed to be transitioning from the optically thin photoionized regime at cosmic noon to eventually coalesce into an intracluster medium (ICM) by  $z = 0$ .”

**“JADES: Discovery of extremely high equivalent width Lyman-alpha emission from a faint galaxy within an ionized bubble at  $z=7.3$ ”** A. Saxena *et al.* arXiv:2302.12805 submitted to Astronomy & Astrophysics (2023-2-24) “We report the discovery of a remarkable Ly $\alpha$  emitting galaxy at  $z=7.278$ , JADES-GS+53.16746-27.7720, with  $\text{EW}_0(\text{Ly}\alpha) \approx 400 \pm 90 \text{ \AA}$  and UV magnitude -16.7. The Ly $\alpha$  line is detected in both lower resolution ( $R \sim 100$ ) PRISM as well as medium resolution ( $R \sim 1000$ ) G140M grating spectra. The Ly $\alpha$  line peaks within 120 km/s of the systemic redshift, indicative of very little neutral gas or dust within the galaxy. The only explanation of the high EW Ly $\alpha$  emission seen in JADES-GS- $z7$ -LA is if it resides in an ionized bubble with radius  $\geq 3 \text{ pMpc}$  [*i.e. in proper units*]. Owing to the faint nature of JADES-GS- $z7$ -LA, we show that it is incapable of single-handedly ionizing a bubble large enough. Therefore, we suggest that JADES-GS- $z7$ -LA (and possibly the companion source) may be a part of a larger overdensity...”

**“Peekaboo: the extremely metal poor dwarf galaxy HIPASS J1131-31”** I.D. Karachentsev *et al.* MNRAS **518** 4, p. 5893 doi: [10.1093/mnras/stac3284](https://doi.org/10.1093/mnras/stac3284) (2022-11-12) “The dwarf irregular galaxy HIPASS J1131-31 resolves into stars in images with Hubble Space Telescope, leading to a distance estimate of  $6.8 \pm 0.7 \text{ Mpc}$ . Spectral optical observations reveal one of the most extremely metal-poor galaxies known with the gas-phase

oxygen abundance  $12 + \log(O/H) = 6.99 \pm 0.16$  dex via the direct [O iii] 4363 line method. The red giant branch of the system is tenuous compared with the prominence of the features of young populations in the colour-magnitude diagram, inviting speculation that star formation in the galaxy only began in the last few Gyr.”

*Newborn galaxy to compensate for the dying ones.*

## - Cosmology

“**A Candid Assessment of Standard Cosmology**” F. Melia, *PASP* **134** 1042, p. 121001, doi: [10.1088/1538-3873/aca51f](https://doi.org/10.1088/1538-3873/aca51f) (2022-12-19) [researchgate.net/publication/365698851\\_A\\_Candid\\_Assessment\\_of\\_Standard\\_Cosmology](https://researchgate.net/publication/365698851_A_Candid_Assessment_of_Standard_Cosmology)

“In this paper, we address eight of the biggest hurdles that have been with us for many years, some of which are now quite serious. [...] Inflation is key to the internal self-consistency of  $\Lambda$ CDM, yet the most probative measurements today are inconsistent with any known slow-roll inflaton potential. [...] big bang nucleosynthesis (BBN) [...] relies on several unfounded assumptions, some of which are actually contradictory. [...] If inflation breaks down, there is no known way for big bang theory to account for the creation of a uniform CMB across vast spatial scales exceeding the size of our causally-connected regions. [...] one is always left with the unanswerable question of how a particular universe was singled out to be observed by us today”

“One cannot avoid the conclusion that the standard model needs a complete overhaul in order to survive.”

“**Modern Aristotelianism**” H. Dingle, *Nature* **139** 784 (1937-5-8)

[semanticscholar.org/paper/Modern-Aristotelianism-Dingle/c7ab6dfb1b724ebcd522fdec6c128e7ce197af8d](https://semanticscholar.org/paper/Modern-Aristotelianism-Dingle/c7ab6dfb1b724ebcd522fdec6c128e7ce197af8d)

“It is, in fact, possible to derive the laws of dynamics rationally. . . without recourse to experience.”

(Prof. E. A. Milne, *Proceedings of the Royal Society, A*, 158, 329; 1937.)”

*Commenting on that statement, Dingle writes:* “It is not a light matter, then, when we find in our own day a revival of Aristotelianism in the front ranks of science itself. The phenomenon may be described in broad terms as an idolatry of which ‘The Universe’ is the god. Precisely what ‘The Universe’ means is not always easy to discover; its worship is sometimes mono- and sometimes poly-theistic, and no two votaries appear to bow before the same altar. But its various forms have this in common that they transcend observation and cannot be derived by induction from observation alone. Furthermore, having been created, they dominate experience instead of representing it.”

*How cosmology was in 1937, how cosmology still is in 2023.*

“Five years hence we shall be celebrating the tercentenary of the death of Galileo and the birth of Newton. It rests with us whether we shall present to their memories a living monument of their own foundation or the resurrection hymn of their adversaries.”

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## A Cosmology Group

*A Cosmology Group* draws its mandate from the *Open Letter to the Scientific Community* to engage scientists in an open exchange of ideas beyond the framework of Standard Cosmology through a critical examination<sup>2</sup> of the methods and investigations of cosmology. The *ACG Newsletter* highlights observational results that are anomalous in terms of the *Horrendous Space Kablooie* paradigm.

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<sup>2</sup>When the thesis is supported by empirical evidence.

<sup>3</sup>ACG currently has 68 members.