Newsletter of ***A Cosmology Group*** - February 2019

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 mainstream framework of a Big Bang cosmology. The *ACG Newsletter* highlights observational results that are anomalous in terms of the ΛCDM model and provides a critical examination[1] of the methods and investigations used in cosmology.

The *Newsletter* is published irregularly, editor's schedule permitting, and when interesting papers are available. ACG subscribers[2] receive notifications of *Newsletter* publications. You can subscribe to *ACG Notifications* either by sending a request to `redshift@cosmology.info`, by joining the ACG Forum 'Alt Cosmology' on *Yahoo! Groups* at `groups.yahoo.com/neo/groups/altcosmology/info#`, or by following `@CosmologyGroup` on Twitter.

If you would like to suggest a paper for review, please send a direct reference to `redshift@cosmology.info`. Published work in a refereed journal and with open access (e.g. a preprint on `arXiv` or `HAL`) is preferred. Summaries of new cosmologies are collected on A Cosmology Model or can be presented at the next ACG Conference.

ACG Editorial

A member commented that everyone in the Group would have in common an interest in the different cosmological tests, available data-sets and comparisons of various models. Anyone interested in cosmology or who is seriously developing an alternative theory has to take an interest in testing it. However, since 85% of ACG members are rather quiet it is difficult to get a feel of the extent of the pool of knowledge and expertise available to all of us.

Hoping to get feedback from more members, this is a request asking the quiet ones to post on Alt Cosmology! Post a comment or an answer to questions such as: What is your area of expertise? How do you use the reviews presented in the *ACG Newsletter*? Is your interest in these publications related to a cosmology model you want to confirm? Or is it just that you want to see how cosmology is evolving? What do you want to get out of the discussion group and what can you contribute? Do you have any comment on the new cosmologies listed on the website?

Regards,

Louis Marmet, February 26, 2019
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Reviewed Publications

Most of the text given here is quoted and adapted from the original articles.
Underline is my emphasis and *my comments are in italics.*

[1]When the thesis is supported by empirical data.
[2]The ACG has 56 subscribers to *ACG Notifications* and 59 followers on *Alt Cosmology Yahoo! Group* and *Twitter*.

- Redshift

"H0LiCOW - IX. Cosmographic analysis of the doubly imaged quasar SDSS 1206+4332 and a new measurement of the Hubble constant"

S. Birrer *et al.*, Monthly Notices of the Royal Astronomical Society, Volume 484, Issue 4, 21 April 2019
doi: 10.1093/mnras/stz200, arXiv:1809.01274

We present a time-delay strong lensing cosmographic analysis of the doubly imaged quasar SDSS 1206+4332. We combine the relative time delay between the quasar images, Hubble Space Telescope imaging, the Keck stellar velocity dispersion of the lensing galaxy, and wide-field photometric and spectroscopic data of the field to constrain two angular diameter distance relations, which imply a Hubble constant $H_0 = 68.8^{+5.4}_{-5.1}\,$km/s/Mpc. The precision of our cosmographic measurement with the doubly imaged quasar SDSS 1206+4332 is comparable with those of quadruply imaged quasars.

Using the combined analysis of the previous three H0LiCOW lenses, we update the combined constraints on the Hubble constant adding the likelihood of SDSS 1206+4332 to the combined sampling of the cosmological parameters. In this work, we impose a more realistic and mildly more informative prior with Ω_m uniform in the range [0.05, 0.5], which our collaboration adopts as our new baseline to quote our measurement of the Hubble constant. We report a measurement of the Hubble constant of $H_0 = 72.5^{+2.1}_{-2.3}\,$km/s/Mpc for the four H0LiCOW lenses. This measurement is independent of the distance ladder and other cosmological probes.

Interestingly, their value is closer to the that obtained using the local distance ladder method (Riess et al. measure $H_0 = 73.48 \pm 1.66\,km/s/Mpc$.) It is becoming clear that measurements of the Hubble constant based on "distances" give consistent values, while measurements based on the last scattering surface of the CMB photons, as assumed by ΛCDM, are only coincidentally close (but disagree at the $> 3\sigma$ level).

- Microwave Background

"Can Early Dark Energy Explain EDGES?"

J.C. Hill, E.J. Baxter, Journal of Cosmology and Astroparticle Physics 2018, No. 08, 037, 2018
doi: 10.1088/1475-7516/2018/08/037, arXiv:1803.07555

The Experiment to Detect the Global Epoch of Reionization Signature (EDGES) collaboration has reported the detection of an absorption feature in the sky-averaged spectrum at $\approx 78\,$MHz. However, the absorption depth reported by EDGES is more than twice the maximal value expected in the standard cosmological model.

We propose an explanation for this depth in which "early dark energy" contributes to the energy density at early times, before decaying rapidly at a critical redshift. However, such models are strongly ruled out by observations of the CMB temperature power spectrum. Moreover, the "early dark energy" models needed to explain the EDGES signal exacerbate the current tension in low- and high-redshift measurements of the Hubble constant.

We conclude that non-finely-tuned modifications of the background cosmology are unlikely to explain the EDGES signal while remaining consistent with other cosmological observations.
Only because one model fails does not mean that all other models will fail!

- Large-Scale Structure

"An intuitive 3D map of the Galactic warp's precession traced by classical Cepheids"

X. Chen *et al.*, Nature Astronomy Feb. 2019
doi: 10.1038/s41550-018-0686-7, arXiv:1902.00998

The Milky Way galaxy's disk of stars is warped. The extent to which our Galaxys stellar and gas disk mor-

phologies are mutually consistent is also unclear. The origin of the warp is associated with torques forced by the massive inner disk.
This shows that galaxies are not only distorted by collisions but can become that way on their own dynamics.

"**The HST Large Programme on NGC6752. I. Serendipitous discovery of a dwarf Galaxy in background**"
L.R. Bedin *et al.*, Monthly Notices of the Royal Astronomical Society: Letters 484, Iss. 1, p. L54, March 2019
doi: 10.1093/mnrasl/slz004, arXiv:1902.00271

We report the discovery of Bedin I, a dwarf spheroidal galaxy too faint and too close to the core of NGC6752 for detection in earlier surveys. *More dark mass discovered?*

"**The puzzling high velocity G5 supergiant star HD 179821: new insight from Gaia DR2 data**"
M. Parthasarathy, G. Jasniewicz, F. Thévenin, Astrophysics and Space Science 364: 18, 25 Jan 2019
doi: 10.1007/s10509-019-3506-3, arXiv:1901.08995

A post-asymptotic giant branch star known as HD 179821 turns out to be significantly less massive than previously thought. Our results clearly confirm that HD 179821 is a post-AGB star of mass in the range of 0.8 M_{sun}. It is not a 30 M_{sun} red supergiant. *GAIA finds the star twice as close as we thought it was! Such an error in distance and mass is hopefully not too common in other distance and mass estimates!*

"**Still Missing Dark Matter: KCWI High-Resolution Stellar Kinematics of NGC1052-DF2**"
S. Danieli *et al.*, Submitted to ApJL, 2019
arXiv:1901.03711

The velocity dispersion of the ultra diffuse galaxy NGC1052-DF2 was found to be $\sigma_{gc} = 7.8\,\mathrm{km/s}$, much lower than expected from the stellar mass – halo mass relation and <u>nearly identical to the expected value from the stellar mass alone</u>. With this confirmation of the low velocity dispersion of NGC1052-DF2, the most urgent question is whether this "missing dark matter problem" is unique to this galaxy or applies more widely.

"**The missing light of the Hubble Ultra Deep Field**"
A. Borlaff *et al.*, Astronomy & Astrophysics 621, A133, 2019
doi: 10.1051/0004-6361/201834312, arXiv:1810.00002

We aim to create a new set of WFC3/IR mosaics (available at this http URL) of the Hubble Ultra Deep field using novel techniques to preserve the properties of the low surface brightness regions. The amount of light recovered with a mean surface brightness dimmer than $\overline{\mu} = 26\,\mathrm{mar\ arcsec}^2$ is equivalent to a m=19 mag source when compared to the XDF and a m=20 mag compared to the HUDF12. We successfully recover a significant amount of over-subtracted diffuse light around the largest objects of the HUDF, not detected by the previous versions of the mosaics. *More previously undetected light.*

"**Detection of Coronal Magnetic Activity in Nearby Active Supermassive Black Holes**"
Y. Inoue, A. Doi, The Astrophysical Journal, Vol. 869, No. 2, p. 114, 2018
doi: 10.3847/1538-4357/aaeb95, arXiv:1810.10732

Central supermassive black holes of active galactic nuclei host coronae with a temperature of $10^9\,\mathrm{K}$. It was long assumed that, like that of the Sun, the coronae were heated by magnetic field activity. However, these magnetic fields had never been measured around black holes, leaving uncertainty regarding the exact mechanism. Based on the coronal radio synchrotron emission from two nearby Seyfert galaxies, we measure a coronal magnetic field of approximately 10 Gauss on scales of $\sim 40 r_s$. This magnetic field strength is weaker than the prediction from the magnetically heated accretion corona scenario.
We don't know what heats the solar corona, and we don't know what heats the AGN corona.

"**A Lonely Giant: The Sparse Satellite Population of M94 Challenges Galaxy Formation**"
A. Smercina *et al.*, The Astrophysical Journal, 863, 152, 2018
doi: 10.3847/1538-4357/aad2d6, arXiv:1807.03779

The dwarf satellites of 'giant' Milky Way-mass galaxies are our primary probes of low-mass dark matter halos. The number and velocities of the satellite galaxies of the MW and M31 initially puzzled galaxy formation theorists, but are now reproduced well by many models. Are galaxy formation models 'overfit'?

In a deep survey of the 'classical' satellites of the MW-mass galaxy M94 out to 150 kpc projected distance, we find **only two** satellites. M94 – a 'lonely giant' which appears to only host two low-mass satellites and is completely devoid of massive companions – may advocate for an important modification to current ideas of how the satellites around MW-mass galaxies form.

"**There is No Missing Satellites Problem**"
S.Y. Kim, A.H.G. Peter, J.R. Hargis, Phys. Rev. Lett. 121, 211302, 2018
doi: 10.1103/PhysRevLett.121.211302, arXiv:1711.06267

A critical challenge to the cold dark matter paradigm is that there are fewer satellites observed around the Milky Way than found in simulations of dark matter substructure. In this Letter, we show that the number of satellite galaxies that inhabit the Milky Way is consistent with the number of luminous satellites predicted by CDM down to halo masses of $\sim 10^8 M_{\odot}$. There is thus no missing satellites problem. If anything, there may be a "too many satellites" problem. The implications for dark matter models are significant. Warm Dark Matter theories equivalent to having thermal relic particle masses below 4 keV are in tension with Milky Way satellite counts.

"**Phat ELVIS: The inevitable effect of the Milky Way's disk on its dark matter subhaloes**"
T. Kelley *et al.*, submitted to MNRAS, 2018
arXiv:1811.12413

We introduce twelve high-resolution cosmological dark matter-only zoom simulations of Milky Way-size ΛCDM haloes. In these simulations, the central galaxy potential destroys subhalos on orbits with small pericenters in every halo. This has several important implications. [...] 3) The enhanced destruction produces a tension opposite to that of the classic "missing satellites" problem: in order to account for ultra-faint galaxies known within 30 kpc of the Galaxy, we must populate haloes with $V_{peak} \simeq 7$ km/s, well below the atomic cooling limit $V_{peak} \simeq 16$ km/s. 4) If such tiny haloes do host ultra-faint dwarfs, this implies the existence of ∼1000 satellite galaxies within 300 kpc of the Milky Way.

The number density of such tiny haloes suggests that there may be ∼100000 ultra-faint galaxies for every L^* galaxy in the universe. ... *extra invisible mass?*

"**A long hard-X-ray look at the dual active galactic nuclei of M51 with NuSTAR**"
M. Brightman *et al.*, The Astrophysical Journal 867, No. 2, 110, 2018
doi: 10.3847/1538-4357/aae1ae, arXiv:1805.12140

Using a deep observation by NuSTAR, new high-resolution coverage of M51b by Chandra, and the latest X-ray torus models, we measure the intrinsic X-ray luminosities of the AGN in these galaxies. The AGN of M51a is found to be Compton thick, and both AGN have very low accretion rates ($\lambda_{Edd} < 10^{-4}$). The latter is surprising considering that the galaxies of M51 are in the process of merging, which is generally predicted to enhance nuclear activity. We find that the covering factor of the obscuring material in M51a is 0.26, consistent with the local AGN obscured fraction. The substantial obscuring column does not support theories that the torus, presumed responsible for the obscuration, disappears at these low accretion luminosities.