The Milky Way Panorama Credit: ESO / S. Brunier

Newsletter of A Cosmology Group - July 2018

A Cosmology Group draws its mandate from the *Open Letter to the Scientific Community* to engage scientists in an open exchange of ideas outside the mainstream framework of the Big Bang cosmology. The *ACG Newsletter* seeks to highlight published observational results which seem anomalous in terms of the ΛCDM model. These results, collected in a database, are accessible to all scientists.

Critical examinations of the scientific methods and investigations used in cosmology are also the subject of the ACG Newsletter, as long as these are supported by empirical data. Purely theoretical work and new cosmologies not yet supported by observations are deferred to future discussions at the next ACG Conference.

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 copy on arXiv) is preferred. The Newsletter is published irregularly, editor's schedule permitting, and when interesting papers are available.

The ACG Newsletter is distributed gratis to our subscribers[1] who receive *ACG Notifications* from the webmaster. You can request a subscription at `redshift@cosmology.info`, join the ACG Forum 'A Cosmology' on *Yahoo! Groups* at `groups.yahoo.com/neo/groups/altcosmology/info#` or follow @CosmologyGroup on Twitter.

ACG Editorial

The keen-eye reader will have noticed many changes on the ACG website. The ACG website crashed on June 24^{th} - it may have been hacked or there was a bug on the server. To avoid a repetition of this accident, the website was completely rewritten in simpler HTML. Hopefully this new version will be more stable. Note also that the ACG e-mail was changed to redshift@cosmology.info, please add it to your whitelist to avoid problems with the delivery of ACG mail.

The domain cosmologystatement.org was acquired by ACG after a long period of being inactive. Many websites point to cosmologystatement.org as the reference for the Open Letter. Now the link is active again.

My attempt to invite observational astrophysicists to join the ranks of the ACG was not very successful. Only 10% of the invitations succeeded, but these were answered by already convinced scientists. It may be that researchers want to avoid "alternatives" since those could negatively affect their research - Chip Arp would tell us more... So the A-word is no longer mentioned on the ACG website. In any case, the Group does not discuss alternative cosmologies, instead we discuss observations which will lead us to a new cosmology. Hopefully all these changes will improve the perception that cosmologists have of ACG.

Many thanks to Yves-Henri Sanejouand, Domingos Soares and everyone else for the links to interesting papers. I also include some references to older work which is still relevant today. Please keep sending your suggestions of interesting papers for review!

Louis Marmet, July 2018
redshift@cosmology.info

[1] The ACG counts 56 subscribers to *ACG Notifications*, and 48 followers on *A Cosmology Yahoo! Group* and Twitter.

Reviewed Publications

Most of the text given here is quoted and adapted from the original articles.

"**Neutrino emission from the direction of the blazar TXS 0506+056 prior to the IceCube-170922A alert**"
IceCube Collaboration,
Science 361, 147151 (2018) https://doi.org/10.1126/science.aat2890, 2018
2018-7-12: Science science.sciencemag.org/content/early/2018/07/11/science.aat2890

A high-energy neutrino event detected by IceCube on 22 September 2017 was coincident in direction and time with a gamma-ray flare from the blazar TXS 0506+056. 9.5 years of IceCube neutrino observations show an excess of high-energy neutrino events, with respect to atmospheric backgrounds, at that position between September 2014 and March 2015. This constitutes 3.5σ evidence for neutrino emission from the direction of TXS 0506+056, independent of and prior to the 2017 flaring episode. This suggests that blazars are identifiable sources of the high-energy astrophysical neutrino flux.

This also marks the launch of a new era of astronomy with the neutrino telescope added to optical and gravitational telescopes. The interest for ACG is highlighted in a proposal made 15 years ago:

http://absimage.aps.org/image/APR05/MWS_APR05-2005-000297.pdf

> APR05 Meeting of The American Physical Society
>
> Neutrino Redshifts - A Search for Information. Charles Gallo, Superconix Inc - Neutrinos will undergo Redshifts due to Doppler and/or Space Expansion effects similar to Electromagnetic Radiation (Photons). However, in some situations (ex., Quasars, etc), Photon Redshifts may be due to cumulative energy-loss mechanisms with the intervening medium. In this situation, the corresponding Neutrino Redshifts will be much smaller since the interaction cross-section for neutrino-medium interactions will be much smaller than any photon-medium cross-section. Thus, observation and comparison of photon redshifts vs corresponding neutrinos redshifts will be very informative. [...] Reference: "Redshifts of Cosmological Neutrinos as Definitive Experimental Test of Doppler versus Non-Doppler Redshifts" by C. F. Gallo in IEEE Trans. Plasma Science, vol. 31, No. 6, pgs. 1230-1231, Dec. 2003.
>
> https://ieeexplore.ieee.org/document/1265343/

TXS 0506+056 is at a redshift $z = 0.34$, a distance large enough to see an energy difference if the energy distribution of neutrinos is narrow enough. With a sufficient number of extragalactic neutrino detections, the proposal will become possible.

"**Discovery of a New Dimming Effect Specific to Supernovae and Gamma-Ray Bursts**"
T.B. Andrews,
viXra viXra:0909.0009, 2009
2009-6-27:

Although strongly biased toward a static non-expanding universe theory, the paper also presents several graphs and data which could be useful for comparisons with other models. Anomalous dimming for the SNs and GRBs and the absence of anomalous dimming for BCGs is shown in several Hubble diagrams. The absence of anomalous dimming in BCGs is used as an argument against the current hypothesis of an accelerated expansion of the universe. The author also shows that the cause of the anomalous dimming must be specific to the SNs and GRBs. The analysis also considers the Tolman Surface Brightness test and the Angular Size test, leading to the conclusion that the universe is static.

"**The Standard Model of Cosmology: A Skeptics Guide**"
D. Scott (without Ali Frolop),
arXiv arXiv:1804.01318, 2018
2018-4-4:

And now, something entertaining: everything is solved in cosmology! Or so says Douglas Scott, who wants the reader to think that the ΛCDM model fits a wide range of data, with just seven free parameters, including more than 1000σ worth of detection of CMB anisotropy power. Worth reading for an overview of the ΛCDM cosmology. According to Scott, all of these assumptions are testable, and they all have been investigated: [to counter Scott's attitude, I allow myself to add some personal comments]

Understanding the Cosmos is possible for human beings [pretentious and not testable]
Physics is the same everywhere and at all times [assumption of metaphysics and not testable]
General relativity is the correct theory of gravity on cosmological scales [assumption and pretentious]
The Universe is approximately statistically homogeneous and isotropic [not true if the universe is fractal]
The Universe is spatially flat on large scales [assumption]
The dark energy behaves like a cosmological constant, with w = 1 [we don't even know what dark energy is!]
The dark matter is collisionless and cold for the purposes of cosmology [we don't even know what dark matter is!]
There are three species of nearly massless neutrinos [best one so far, until another neutrino is discovered]
There are no additional light particles contributing to the background [until more precise measurements!]
Density perturbations are adiabatic in nature [within some limits]
The initial conditions were Gaussian ["initial" is an assumption and not testable]
The running of the primordial power spectrum is negligible ["primordial" is an assumption]
The contribution of gravitational waves is negligible [even Newton knew that!]
Topological defects were unimportant for structure formation [we don't even understand structure formation!]
The physics of recombination is fully understood [pretentious and not testable]
One parameter is sufficient to describe the effects of reionisation [I'll bet $10000 that this is wrong]

Domingos Soares' criticism of Scott's paper highlights the cynicism some scientists use when they find themselves in a precarious situation. Soares' paper is at lilith.fisica.ufmg.br/dsoares/ncgc/despair.pdf. Enjoy!

More seriously, I believe that Scott's attitude is to be avoided in science.

"**Lack of time-dilation in type Ia supernovae and Gamma-Ray Bursts**"
D.F. Crawford,
arXiv arXiv:1804.10274, 2018
2018-3-22:

This more recent paper by David Crawfors looks specifically at the time-dilation in luminosity curves of type Ia supernovae and Gamma-Ray Bursts. In an expanding universe any time-dependent characteristics of distant objects must appear to scale by the factor 1 + z. Light curves of type Ia supernovae and the duration of Gamma-Ray Bursts (GRB) can directly measure time-dilation over a wide range of redshifts. An analysis of raw observations of type Ia supernovae light curves show that their widths are proportional to (1 + z)(0.0880.036), and that for GRBs they are proportional to (1 + z)(0.270.13). Both are consistent with no time-dilation and inconsistent with a factor of (1 + z) which implies that the universe is static.

The author explains the problems in the SALT2 method for calibrating the type Ia supernovae light curves. For GRBs, the author does a re-analysis of the results by including a weighted regression and a different correction for bursts that could be lost below the background noise. The final result shows that the original raw GRB are consistent with no time-dilation.

"**Can the apparent expansion of the Universe be attributed to an increasing vacuum refractive index?**"
X. Sarazin, F. Couchot, A. Djannati-Ataï, M. Urban,
arXiv arXiv:1805.03503, 2018
2018-5-3:

Gravitation is described phenomenologically by a spatial change of the "refractive index" of the vacuum around a gravitational mass. The apparent expansion of the Universe is caused by a cosmological time dependence of the global vacuum index. In this paper, a flat and static Euclidean metric with a change with time of the vacuum index is used. An index increasing with time produces both the cosmological redshift and time dilation.

The only data modeled in this paper is type Ia supernovae data, from the joint SDSS-II and SNLS SNe-Ia samples, which fit a vacuum index varying exponentially as $n(t) = exp(t/\tau_0)$, where $\tau_0 = 8.0^{+0.2}_{-0.8}$ Gyr. This confirms exponential fits found in other papers (not a linear dependence of z on distance!) However here, the cosmological redshift should affect atomic energies, with a relative decrease of the energy levels of about -2×10^{-18} s^{-1}. Possibilities for an experimental investigation of this prediction are discussed which could distinguish between tired-light models and a time dependence of the global vacuum index.

"**The well-earned Nobel Prize for the wrong reason**"
P. Ostermann,
peter-ostermann.org/assets/nobel-prize-physics-2011.pdf, 2011
2011-10-12: More on http://peter-ostermann.org/.

An interesting examination of the scientific methods and philosophy used in cosmology. "Because of the many adjustments leading to numerical success, this combination is called by the remarkable name Cosmological Concordance Model. This labeling might convey an association that scientists are trying to find the right model for the universe quasi by vote. Like in Galileo's time, something still seems to revolve around the power of interpretation. And it is not very encouraging to remember that the Ptolemaic System itself was the most successful concordant model for a long time - and even numerically more convincing, than thereon the original model of Copernicus."

The paper shows complete trust in relativity theory, with good reasons. But as an experimentalist I can't fail to notice that the discussion completely avoids tired light models which also predict an exponential Hubble diagram.

"**CANDELS: The Correlation Between Galaxy Morphology and Star Formation Activity at** $z \sim 2$"
B. Lee *et al.*, The Astrophysical Journal, Vol. 774, No. 1, 2013
2013: http://iopscience.iop.org/0004-637X/774/1/47/
See also: http://www.sciencedaily.com/releases/2013/08/130815083953.htm

Studying the evolution and anatomy of galaxies an international team of astronomers have established that mature-looking galaxies existed when the universe was only about 3.3 billion years old. The study shows that the shapes and colors of these extremely distant young galaxies, big and small, fit the visual classification system introduced in 1926 by Edwin Hubble and known as the Hubble Sequence.

"Clearly, the Hubble Sequence formed very quickly in the history of the cosmos, it was not a slow process," adds Giavalisco, one author of the study. "Now we have to go back to theory and try to figure out how and why." "Taken altogether, our results show that the correlations between morphology as traced by a suite of common diagnostics, and broadband UV/optical spectral types of the mix of relatively massive galaxies (i.e., $M > 10^9 M_{sun}$) at $z \sim 2$ are quantitatively and qualitatively similar to those observed for their counterparts in the local universe. We interpret these results as evidence that the backbone of the Hubble sequence observed today was already in place at $z \sim 2$."