Monthly Notes of the Alternative Cosmology Group – 2011

Part One: April to July 2011

The ACG Webmaster who distributes this newsletter to subscribers would prefer not to receive related correspondence.

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The ACG newsletter is distributed gratis to subscribers. Get onto our mailing list without obligation at www.cosmology.info/newsletter. The current newsletter is a review of more than 12,000 papers published on arXiv under astro-ph, together with 6500 under gen-phys, for the months of April to December, 2011. We now include papers archived elsewhere, provided access is full and open. The Alternative Cosmology Group draws its mandate from the open letter published in *New Scientist*, 2004 (www.cosmologystatement.org), and these monthly notes seek to publicise recently published empirical results that are aligned with that ethos. In other words, what observations seem anomalous in terms of the Standard Model of Cosmology? We prefer observational results and tend to avoid complete cosmologies and purely theoretical work. Discussion of method is welcome. If you would like to suggest recently published or archived papers for inclusion, please send the arXiv, viXra or other direct reference and a brief exposition to Hilton Ratcliffe (hilton@hiltonratcliffe.com). Note that our spam filter rejects slash and colon in the text, so please write web addresses commencing "www".

I. Editorial comment

I apologise most profusely for the delay in getting the MNACG out to you. Hopefully, we're back on track now. This newsletter and one that follows are going to cover several months each, so please pardon their lengthiness.

- Modern cosmology, and indeed, much of modern physical science, is self-serving. It is not designed to make fundamentally new discoveries, merely to explore the current knowledge base. Even worse, where the assumptions cannot be tested independently of the model (and most of cosmology falls into this category), the assumption becomes law and forms the base for further assumptions. Here's the thing—if a scientific enquiry is conducted on the basis of an assumed model, and moves towards a result or outcome of that enquiry in a series of progressive logical steps, then clearly, the final result is assumed. The whole process is

anchored in an assumed model; therefore the outcome is a subset of that initial assumption. Furthermore, the system reinforces itself. An example is the distance ladder, which at extragalactic scales is based entirely upon the untested assumption of exclusively Doppler redshift in expanding spacetime. No tests have been conducted independently of that assumption, nor can they be, with current and foreseeable technology. We can see expansion only if expansion is assumed; otherwise, we cannot. It's as simple as that. The Gamma Ray Burst (GRB) distance modulus does not fit the LCDM model, and indeed, challenges it, just as QSOs did initially, by virtue of their excessive brightness at the assumed redshift distance. The situation in respect of quasars was "solved" by adding further theoretical layers to the model. It was quite simple really—Black Hole mass was brought into the equation, and BHs are virtually infinitely tuneable parameters. It is not an excessive exaggeration to suggest that doubts surrounding the existence of the Tooth Fairy could be allayed by using Black Holes in the argument. The important point is that the exception was dealt with from *within* the model, not independently of it. No doubt the GRB problem will be solved in the same way. It is often stated that Edwin Hubble "discovered" universal expansion, or at least observed it in practice, when in fact the reality is far less spectacular: He temporarily believed he had seen a relationship between redshift and luminosity of local galaxies. It is now being asserted that since the Hubble relation between redshift and recessional velocity depends upon the repulsive effect of Dark Energy, what those gentlemen did in the 1920s is observationally discover Dark Energy. Quote: "*After the discovery of dark energy, it was suggested that the dynamics of local expansion flows is dominated by omnipresent dark energy, and it is the dark energy antigravity that is able to introduce the linear velocity-distance relation to the flows. It implies that Hubble's law observed at local distances was in fact the first observational manifestation of dark energy. If this is the case, the commonly accepted criteria of scientific discovery lead to the* ***conclusion: In 1927, Lemaître discovered dark energy and Hubble confirmed this in 1929***." (from the paper "Lemaître and Hubble: What was discovered - if any - in 1927-29?" By A.D. Chernin arXiv:1107.5695).

This is how discoveries are made, cosmologists seem to be telling us.

- Please don't miss the paper by Bonvin and Durrer "*What Galaxy Surveys Really Measure*", listed here as V.2.
- A colleague has passed on a link to British physicist Thomas Smid's very interesting website *"Physics myths and physics facts"*: http://www.physicsmyths.org.uk/

II. Members' books

1. Thierry de Mees – The Solar Protuberance Theory http://www.worldsci.org/pdf/ebooks/Planetary-System-Creation-Theory.pdf

III. Supernovae and Standard Candles

Editor: The cosmological distance ladder beyond triangulation is based upon the assumption of Standard Candles (eg. Cepheid Variables and SNe). However, this assumption is speculative and fraught with exceptions which lead to an ever-increasing number of classes.

1. **Title: The Subluminous and Peculiar Type Ia Supernova PTF09dav**
   Authors: M. Sullivan et al
   arXiv:1103.1797

   Quote: *"PTF09dav is a peculiar subluminous type Ia supernova (SN) discovered by the Palomar Transient Factory (PTF). Spectroscopically, it appears superficially similar to the class of subluminous SN1991bg-like SNe, but it has several unusual features which make it stand out from this population. Its peak luminosity is fainter than any previously discovered SN1991bg-like SN Ia (M_B -15.5), but without the unusually red optical colors expected if the faint luminosity were due to extinction. The photospheric optical spectra have very unusual strong lines of Sc II and Mg I, with possible Sr II, together with stronger than average Ti II and low velocities of ~6000 km/s. The host galaxy of PTF09dav is ambiguous. The SN lies either on the extreme outskirts (~41kpc) of a spiral galaxy, or in an very faint (M_R>-12.8) dwarf galaxy, unlike other 1991bg-like SNe which are invariably associated with massive, old stellar populations. PTF09dav is also an outlier on the light-curve-width--luminosity and color--luminosity relations derived for other sub-luminous SNe Ia. The inferred 56Ni mass is small (0.019+/-0.003Msun), as is the estimated ejecta mass of 0.36Msun. Taken together, these properties make PTF09dav a remarkable event. We discuss various physical models that could explain PTF09dav. Helium shell detonation or deflagration on the surface of a CO white-dwarf can explain some of the features of PTF09dav, including the presence of Sc and the low photospheric velocities, but the observed Si and Mg are not predicted to be very abundant in these models. We conclude that no single model is currently capable of explaining all of the observed signatures of PTF09dav."*

2. **Title: Supernovae type Ia: non-standard candles of the Universe**
   Authors: A. I. Bogomazov, A. V. Tutukov
   http://arxiv.org/abs/1104.0747
   Quote: "The observed dependence of the distance modulus from the red shift in observations of SNe Ia can be explained not only by the assumption about accelerated expansion of the Universe, but also by the evolution of the absorption of light by grey dust in various types of host galaxies of SNe Ia, by the effects of observational selection and by the decrease in the average mass of coalescing degenerate dwarfs."

3. **Title: The effect of metallicity on the delay-time distribution of type Ia supernova**
   Authors: Xiangcun Meng, Zhongmu Li, Wuming Yang
   arXiv:1105.5265v
   Quote: *"Furthermore, we noticed that the contribution of WD + RG channel from the low metallicity population is higher than that from the high metallicity one. However, we can not quantitatively obtain a DTD consistent with the results of Strolger et al. (2010) by changing metallicity. As a consequence, metallicity may partly contribute to the DTD of SNe Ia and should therefore be checked carefully when one derives the DTD of SNe Ia from observations."*

Editor: Expansion velocities for this 1A SN swing from 9k km/sec to 14k km/sec, depending on the element being studied.

4. **Title: The Most Slowly Declining Type Ia Supernova 2001ay**
   Authors: Kevin Krisciunas et al
   arXiv:1106.3968
   Quote: *"We present optical and near-infrared photometry, as well as ground-based optical spectra and Hubble Space Telescope ultraviolet spectra, of the Type Ia supernova (SN) 2001ay. At maximum light the Si II and Mg II lines indicated expansion velocities of 14,000 km/sec, while Si III and S II showed velocities of 9,000 km/sec There is also evidence for some unburned carbon at 12,000 km/sec."*

5. **Title: A More General Model for the Intrinsic Scatter in Type Ia Supernova Distance Moduli**
Authors: John Marriner, et al
arXiv:1107.4631
Quote: *" We have modeled the distribution of supernovae Ia in terms of their color and conclude that there is strong evidence that variation in color is a significant contributor to the scatter of supernovae Ia around their standard candle magnitude."*

IV. MOND

1. **Title: MOND and the unique void galaxy KK246**
Authors: Mordehai Milgrom
arXiv:1104.1118
Quote: *"However, in the framework of the dark-matter paradigm--where the mass discrepancy is strongly dependent on the buildup history of a galaxy--every new such conformity with a tight law is another difficult-to-understand surprise, and does carry a new import: What, in the LCDM paradigm, would prevent such galactic baryons from residing in a halo of half, or twice, the observed rotational velocities, instead of selecting exactly the velocities predicted by MOND? This conundrum is especially poignant for KK246, whose great isolation points to a relatively unique buildup history. This note underscores the individual importance of each galaxy as a new test, as opposed to the view of them all as a statistical ensemble."*

2. **Title: MOND cosmology from holographic principle**
Authors: Hongsheng Zhang, Xin-Zhou Li
arXiv:1106.2966

Quote: *"We derive the MOND cosmology which is uniquely corresponding to the original MOND in galaxies via holographic approach of gravity. It inherits the key merit of MOND, that is, it reduces the byronic matter and mysterious non-byronic dark matter (dark matter for short) in the standard cosmology into byronic matter only. For the first time we derive the critical parameter in MOND, i.e., the transition acceleration a_c on cosmological scale. We thus solve the long-standing coincidence problem $a_c\sim cH_{0}$."*

Editor: Theoretical physicist and *enfant terrible* of WMAP analysts (he coined the term "axis of evil" for the preferred velocity in the CMB), Joao Magueijo has produced an interesting paper on MOND. Some of you may recall that Joao was on our guest list for CCC1, but later withdrew.

3. **Title: The case for testing MOND using LISA Pathfinder**
Authors: Joao Magueijo, Ali Mozaffari
arXiv:1107.1075
Quote: *"We quantify the potential for testing MOdified Newtonian Dynamics (MOND) with LISA Pathfinder (LPF), should a saddle point flyby be incorporated into the mission. We forecast the expected signal to noise ratio (SNR) for a variety of instrument noise models and trajectories past the saddle. For standard theoretical parameters the SNR reaches middle to high double figures even with modest assumptions about instrument performance and saddle approach. Obvious concerns, like systematics arising from LPF self-gravity, or the Newtonian background, are examined and shown not to be a problem. We also investigate the impact of a negative observational result upon the free-function determining the theory. We demonstrate that, if Newton's gravitational constant is constrained not be re-normalized by more than a few percent, only very contrived MONDian free-functions would survive a negative result. Finally we scan the structure of all proposed relativistic MONDian theories. We conclude that only the Einstein-Aether formulation would survive a negative result."*

4. **Title: NGC 2419 does not challenge MOND**
Authors: R.H. Sanders
arXiv:1107.4953
Quote: *"I show that, in the context of MOND, non-isothermal models, approximated by high order polytropic spheres, are consistent with the observations of the radial distribution of the line-of-sight velocity dispersion in the*

distant globular cluster, NGC 2419. This calls into question the claim by Ibata et al. that the object constitutes a severe challenge for MOND. In general, the existence and properties of globular clusters are more problematic for LCDM than for MOND."

V. Redshift

5. **Title: Rees--Sciama Effect and Impact of Foreground Structures on Galaxy Redshifts**
Authors: Hu Zhan
arXiv:1105.5249
Quote: *"We estimate the Rees--Sciama (RS) effect of super structures on the cosmic microwave background (CMB) temperature fluctuations and identify a related effect on galaxy redshifts. By numerically solving the geodesic equation, we find that both superclusters and supervoids can decrease the temperature of the CMB by several micro Kelvin in the central region and increase the temperature slightly in the surrounding area due to the RS effect. The two components of the RS effect, redshift and gravitational time delay, largely cancel each other, leaving an equivalent but much smaller effect on the CMB photons that started out at the same time from the distorted last scattering surface. For galaxies, the time delay effect is separable from the redshift effect, and the slight change to the redshift induced by super structures can be at the percent level of large-scale rms bulk velocities, which might only be detected statistically. On much smaller scales, a tiny redshift difference between two images of a strongly lensed source should exist in general, which is related to the Hubble expansion rate at the source redshift. However, as Loeb (1998) pointed out, observational issues and the proper motion of the structure would make such a measurement impossible."*

Editor: I consider the following paper by Bonvin and Durrer to be one of the most important to be published in recent times:

6. **Title: What galaxy surveys really measure**
Authors: Camille Bonvin, Ruth Durrer
arXiv:1105.5280
Quote: *"In this paper we compute the quantity which is truly measured in a large galaxy survey. We take into account the effects coming from the fact that we actually observe galaxy redshifts and sky positions and not true spatial positions. Our calculations are done within linear perturbation theory for both the metric and the observer velocities but they can be used for non-linear matter power spectra. We shall see that the complications due to the fact that we only observe on our background lightcone and that we do not truly know the distance of the observed galaxy, but only its redshift is not only an additional difficulty, but even more a new opportunity for future galaxy surveys."*

7. **Title: A luminous quasar at a redshift of z = 7.085**
Authors: **Daniel J. Mortlock**
arXiv:1106.6088
Quote: *"The intergalactic medium was not completely reionized until approximately a billion years after the Big Bang, as revealed by observations of quasars with redshifts of less than 6.5. It has been difficult to probe to higher redshifts, however, because quasars have historically been identified in optical surveys, which are insensitive to sources at redshifts exceeding 6.5. Here we report observations of a quasar (ULAS J112001.48+064124.3) at a redshift of 7.085, which is 0.77 billion years after the Big Bang. ULAS J1120+0461 had a luminosity of 6.3x10^13 L_Sun and hosted a black hole with a mass of 2x10^9 M_Sun (where L_Sun and M_Sun are the luminosity and mass of the Sun). The measured radius of the ionized near zone around ULAS J1120+0641 is 1.9 megaparsecs, a factor of three smaller than typical for quasars at redshifts between 6.0 and 6.4. The near zone transmission profile is consistent with a Ly alpha damping wing, suggesting that the neutral fraction of the intergalactic medium in front of ULAS J1120+0641 exceeded 0.1. "*

8. **Title: Redshift and distances in a ΛCDM cosmology with non-linear inhomogeneities**
Authors: Nikolai Meures, Marco Bruni
arXiv:1107.4433

Quote: *"Along lines of sight with density inhomogeneities which average out on scales less than the Hubble radius, we find the distance redshift relation to diverge negligibly from the Friedmann-Lemaitre-Robertson-Walker (FLRW) result.* ***On the contrary, if we observe along lines of sight which do not have the same average density as the background, we find large deviations from the FLRW distance redshift relation.*** *Hence, a possibly large systematic might be introduced into the analysis of cosmological observations, e.g. supernovae, if we observe along lines of sight which are typically more or less dense than the average density of the Universe. In turn, this could lead to wrong parameter estimation:* ***even if the Cosmological Principle is valid, the identification of the true FLRW background in an inhomogeneous universe maybe more difficult than usually assumed****."*

VI. Stellar Evolution and Large-Scale Structure

1. **Title: Is the Universe homogeneous?**
   Authors: Roy Maartens
   arXiv:1104.1300

   Quote: ***"****Thus we are currently unable to prove homogeneity of the Universe on large-scales, even with the Copernican Principle. However we can use observations of galaxies and clusters to test the Copernican Principle itself.****"***

VII. Big Bang

2. **Title: LCDM: Triumphs, Puzzles and Remedies**
   Authors: L. Perivolaropoulos
   a arXiv:1104.0539

   Quote: *"The consistency level of LCDM with geometrical data probes has been increasing with time during the last decade. Despite of these successes, there are some puzzling conflicts between LCDM predictions and dynamical data probes (bulk flows, alignment and magnitude of low CMB multipoles, alignment of quasar optical polarization vectors, cluster halo profiles). Most of these puzzles are related to the existence of preferred anisotropy axes which appear to be unlikely close to each other."*

3. **Title: Reactor sterile neutrinos, dark energy and the age of the universe**

   Authors: Jostein R. Kristiansen, Oystein Elgaroy

   http://arxiv.org/abs/1104.0704

   Quote: "*To summarize, we have investigated how the presence of one or two sterile neutrinos with the properties estimated in Kopp et al. (2011) changes the preferred values of cosmological parameters. Rather than deriving constraints on neutrino properties from cosmology, we chose the opposite approach of using neutrino experiments to constrain cosmology … It more likely means that the correct dark energy model cannot be described by a constant w. If the evidence for sterile neutrinos from oscillation experiments becomes conclusive the implication could be that the cosmological constant is ruled out as dark energy*."

VIII. Method

1. **Title: Extracting science from surveys of our Galaxy**

   Authors: James Binney

   arXiv:1104.2839

   Quote: *"Our knowledge of the Galaxy is being revolutionised by a series of photometric, spectroscopic and astrometric surveys. Already an enormous body of data is available from completed surveys, and data of ever increasing quality and richness will accrue at least until the end of this decade. To extract science from these surveys*

we need a class of models that can give probability density functions in the space of the observables of a survey -- we should not attempt to "invert" the data from the space of observables into the physical space of the Galaxy. Currently just one class of model has the required capability, so-called "torus models". A pilot application of torus models to understanding the structure of the Galaxy's thin and thick discs has already produced two significant results: a major revision of our best estimate of the Sun's velocity with respect to the Local Standard of Rest, and a successful prediction of the way in which the vertical velocity dispersion in the disc varies with distance from the Galactic plane."

2. **Title: Interstellar dust**

   Authors: M. Compiegne

   a arXiv:1104.2949
   Quote: *"Dust is a key component of the Universe, especially regarding galaxies evolution, playing an essential role for both the physics and chemistry of the interstellar medium. In this paper, we give a brief review of interstellar dust. We describe the main dust observables and how it allows us to constrain dust properties. We discuss the dust lifecycle and the dust evolution in the ISM. We also present a physical dust model, DustEM."*

3. **Title: Extraterrestrial Life and Censorship**
   Authors: N. Chandra Wickramasinghe
   http://arxiv.org/abs/1104.1314

4. **Title: Do recent accurate measurements of H_0 really rule out void models as alternatives to dark energy?**
   Authors: Antonio Enea Romano
   http://arxiv.org/abs/1105.1864
   Quote: *"Recent accurate measurements of H_0 have been claimed to be enough to rule out void models as alternatives to dark energy. Using a local redshift expansion for the luminosity distance and the constraint from the age of the Universe we show that the parameters defining a general LTB model give enough freedom to be in agreement with any value of H_0."*

Editor: The following paper by Shanks et al is a good illustration of how model-dependent astrophysics influences method in order to achieve the desired result. The assumptions are that redshift indicates remoteness, therefore that the QSOs are so incredibly energetic that normal physics cannot explain the luminosity, and consequently, that Black Holes have to be invoked as a supernatural source of radiant energy.

5. **Title: Do all QSOs have the same black hole mass?**
   Authors: T. Shanks, S.M. Croom, S. Fine, N.P. Ross, U. Sawangwit
   arXiv:1105.2547

   Quote: "QSOs from SDSS, 2QZ and 2SLAQ covering an order of magnitude in luminosity at fixed redshift exhibit similar amplitudes of clustering. In addition, QSO clustering evolution at z>0.5 is well fitted by a model that assumes a fixed host halo mass, implying that QSOs may occur in a relatively narrow range of halo and BH mass. We argue that the slow evolution of early-type galaxies out to z~1-2 may also provide support for a slow evolution of QSO host BH masses. The result would mean that if high-z QSOs radiate at Eddington rates then low-z SyI must radiate at ~100x less than Eddington. We conclude that models where QSOs radiate at L_Edd require M_BH and M_halo to be decoupled to circumvent the clustering results. While single BH mass and flickering models fit the z>0.5 clustering results, they appear to be rejected by the z~0, M_BH-L relation from reverberation mapping. We find that the inclusion of z<0.5 QSO clustering data improves the fit of a long-lived QSO model and suggest that the predictions of a PLE model for QSO BH masses agree reasonably with UV-bump and reverberation estimates (abridged)."

Editor: BBT is based upon some initial assumptions that seem to be challenged by observation, and require additional theoretical garnishing to maintain the fit. A core assumption is that the solid structure of the Universe could have emerged from a primordial diffuse gas.

6. **Title: Does External Pressure Explain Recent Results for Molecular Clouds?**
   Authors: George Field, Eric Blackman, Eric Keto
   arXiv:1106.3017

7. **Title: Re-ionizing the Universe without Stars**
   Authors: Michael A. Dopita , Lawrence M. Krauss Ralph S. Sutherland Chiaki Kobayashi Charles H. Lineweaver
   arXiv:1106.5546
   Quote: *"Recent observations show that the measured rates of star formation in the early universe are insufficient to produce re-ionization, and therefore, another source of ionizing photons is required."*
   Editor: Or, perhaps, another model?

IX. Black Holes

1. **Title: Key problems in black hole physics today**
   Authors: Pankaj S. Joshi
   http://arxiv.org/abs/1104.3741
   Quote: *"We review here some of the major open issues and challenges in black hole physics today, and the current progress on the same. It is pointed out that to secure a concrete foundation for the basic theory as well as astrophysical applications for black hole physics, it is essential to gain a suitable insight into these questions."*

X. History

1. **Title: Lemaître's Hubble relationship**
   Authors: M.J. Way (NASA/GISS), Harry Nussbaumer (ETH, Switzerland)
   http://arxiv.org/abs/1104.3031
   Quote: *"Edwin Hubble is often credited with discovering the expanding Universe based on spectra taken by him. This statement is incorrect and we feel that it is the responsibility of those who are aware of the historical facts to set the record straight."*

2. **Title: Did Edwin Hubble plagiarize?**
   Authors: Giora Shaviv
   arXiv:1107.0442
   Quote: *"Recently Block published an astro-ph{{this http URL (2011).}} insinuating that Lemaitre discovery paper of the Expanding Universe was censored prior to its translation into English and publication in the Monthly Notices of the Royal Astronomical Society. Consequently, Lemaitre's credit for the discovery of the velocity-distance correlation was not recognized. We examine here the chain of events leading to the discovery of the 'Hubble law'. Our summary: (a) Lemaitre found a theoretical linear correlation between velocity and distance. (b) Lemaitre assumed the existence of a linear relation between velocity and distance and calculated the coefficient. (c) Hubble took the data plotted it and demonstrated that a linear relation represents the observed data. (d) Hubble never believed in Lemaitre's solution, namely in an expanding universe. Consequently, Hubble never cited Lemaitre. We conclude that the charge that Lemaitre's paper was censored or ignored let alone plagiarized by Hubble, is not founded, and explain why Lemaitre's earlier theoretical discovery and derived 'Hubble constant' was not cited or recognized, by Hubble as well as by many other leading researchers."*