



Monthly Notes of the Alternative Cosmology Group – 2011

Part Two: August to December 2011

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

Please address all correspondence to MNACG Editor, Hilton Ratcliffe: mnacg_editor@cosmology.info.

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 again for the delay in getting the MNACG out to you. This newsletter and one that preceded it cover several months each, so please pardon their lengthiness.
- After a period of inactivity, George Ellis has published again in the period under review, and his papers can be linked via III.1, VI.1 and 3, and VII.4 and 5. Ellis has been a leading proponent of emergence, with a top-down view of galaxy evolution that ties in with Arp’s observations of QSO ejection from AGN. Also welcome after some time is a paper by Mike Disney, see VI.2. I have included a link to a pertinent 2008 Disney paper on galaxy evolution – VI.4.
- The following letter speaks for itself:
 “In the August, 2010 edition you presented a request for arXiv authors who might be interested in endorsing scientific articles on cosmology to arXiv. Did you get any responses? And, if so, would I be able to get a list of such authors? I have a paper on cosmology that I am currently trying to get published at JCAP. However, that process takes a while - and I would like to make it available on arXiv in parallel with the potential publication at JCAP.
 “Regards, Charles H. Ross charlie_ross@knology.net “
- Those that share my interest in plasma cosmology should find the following paper interesting:
[Measurement of the Electric Current in a kpc-scale Jet](#) P. P. Kronberg *et al.* 2011 *ApJ* **741** L15

II. Members' books

1. **The Big Bang – A critical analysis**, by Timothy Eastman, Ashwini Kumar Lal, R. Joseph, and Hilton Ratcliffe.
<http://www.amazon.com/dp/B005NMJGLE>

III. Supernovae and Standard Candles

1. Title: (Mis-)Interpreting supernovae observations in a lumpy universe

Authors: [Chris Clarkson](#), [George Ellis](#), [Andreas Faltenbacher](#), [Roy Maartens](#), [Obinna Umeh](#), [Jean-Philippe Uzan](#)
[arXiv:1109.2484](#)

Quote: "Light from 'point sources' such as supernovae is observed with a beam width of order of the sources' size - typically less than 1 AU. Such a beam probes matter and curvature distributions that are very different from coarse-grained representations in N-body simulations or perturbation theory, which are smoothed on scales much larger than 1 pc. The beam typically travels through unclustered dark matter and hydrogen with a mean density much less than the cosmic mean, and through dark matter mini-halos and hydrogen clouds. Large dark matter halos are rarely encountered directly and so are mainly experienced through their Weyl (tidal) curvature. How observations of many such beams averages this Weyl curvature into the Ricci curvature of the background is not understood. Standard analyses predict a huge variance for such tiny beam sizes, and nonlinear corrections appear to be non-trivial. It is not even clear whether under-dense regions lead to dimming or brightening of sources, owing to the uncertainty in modelling the expansion rate. By considering different reasonable approximations which yield very different cosmologies we argue that modelling ultra-narrow beams accurately is a critical problem for precision cosmology. This could appear as a discordance between angular diameter and luminosity distances when comparing SN observations to BAO or CMB distances."

2. Title: Type Ia Supernovae and the discovery of the Cosmic Acceleration

Authors: [Alejandro Clocchiatti](#)

[arXiv:1112.0706](#)

Quote: "I present a review of the research and analysis paths that converged to make Type Ia SNe the most mature cosmological distance estimator of the present time. The narrative starts with the first works in the early decades of the 20th century and finishes with the more recent results. The review was written by a member of the High Z Supernova Search Team, the international group of astronomers that discovered Cosmic Acceleration in 1998. This result, confirmed by the Supernova Cosmology Project in 1999, received an impressive string of recognition culminating with the current Nobel prize in Physics. The review is presented thinking of physicists with a strong interest in Cosmology, who might have pondered why was that, after decades of not being able to agree upon the rate of cosmic expansion, astronomers were so quick to concur on cosmic acceleration."

IV. ΛCDM Model

1. Title: The $R = ct$ Universe

Authors: [Fulvio Melia](#), [Andrew Shevchuk](#)

[arXiv:1109.5189](#)

Quote: "The backbone of standard cosmology is the Friedmann-Robertson-Walker solution to Einstein's equations of general relativity (GR). In recent years, observations have largely confirmed many of the properties of this model, which is based on a partitioning of the universe's energy density into three primary constituents: matter, radiation, and a hypothesized dark energy which, in ΛCDM, is assumed to be a cosmological constant Λ. Yet with this progress, several unpalatable coincidences (perhaps even inconsistencies) have emerged along with the successful confirmation of expected features. One of these is the observed equality of our gravitational horizon $R_h(t_0)$ with the distance ct_0 light has traveled since the big bang, in terms of the current age t_0 of the universe. This equality is very peculiar because it need not have occurred at all and, if it did, should only have happened once

(right now) in the context of LambdaCDM. In this paper, we propose an explanation for why this equality may actually be required by GR, through the application of Birkhoff's theorem and the Weyl postulate, at least in the case of a flat spacetime. If this proposal is correct, $R_h(t)$ should be equal to ct for all cosmic time t , not just its present value t_0 . Therefore models such as LambdaCDM would be incomplete because they ascribe the cosmic expansion to variable conditions not consistent with this relativistic constraint. We show that this may be the reason why the observed galaxy correlation function is not consistent with the predictions of the standard model."

Editor: Astrophysics-by-modelling, though entertaining, carries with it the problem of bias, and tuning for a preferred result. Schneider *et al*'s paper is a case in point. We are left with a dilemma—primordial Dark Matter could not have been both warm and cold.

2. Title: Nonlinear Evolution of Cosmological Structures in Warm Dark Matter Models

Authors: [Aurel Schneider](#), [Robert E. Smith](#), [Andrea V. Maccio](#), [Ben Moore](#)

[arXiv:1112.0330](#)

Quote: "In all cases we find interesting deviations with respect to CDM. In particular, the concentration-mass relation displays a turnover for group scale dark matter haloes, for the case of WDM particles with masses of the order ~ 0.25 keV. This may be interpreted as a hint for top-down structure formation on small scales. We implement our results into the halo model and find much better agreement with simulations. On small scales the WDM halo model now performs as well as its CDM counterpart."

V. Redshift

1. Title: Intrinsic Plasma Redshifts Now Reproduced in the Laboratory - a Discussion in Terms of New Tired Light.

Authors: [Lyndon Ashmore](#)

[viXra:1105.0010](#)

Quote: "This paper gives an overview of the laboratory results of Chen *et al* and relates them to the predictions previously made by the New Tired Light Theory. The plasma induced redshift, line broadening are all as predicted by New Tired Light. A further laboratory test is suggested whereby New Tired Light predicts the wavelength of the secondary radiation ($\lambda = 0.1\text{mm}$) emitted by the plasma - should New Tired Light be responsible for the redshifts. If this relatively easy and inexpensive test is carried out then it could settle the matter once and for all. Regardless of this, now that it has been shown in the laboratory that plasma induce intrinsic redshifts, will this be incorporated into the Big Bang theory? The Universe is a big place filled with plasma and these laboratory results show that this plasma induces redshifts. Experience tells me that mainstream science will ignore good science."

2. Title: Gamma-Ray Lines of X-Class Solar Flare of July 23rd, 2002 Provide Direct Evidence for New Tired Light

Authors: [Lyndon Ashmore](#)

Quote: "The solar flare of July 23rd, 2002 was the first γ - ray flare to be observed in high resolution by the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI). The observations showed unexpectedly high redshifts in the γ - rays detected, but with no 'apparent pattern'. The shifts appear to be intrinsic as they occur along a direct line of sight and not perpendicular to the solar surface as expected by Doppler effects. This paper looks at the wavelengths of the observed photons and, in particular, the shift in each wavelength suffered by the six nuclear de-excitation lines of ^{12}C , ^{56}Fe , ^{24}Mg , ^{20}Ne , ^{16}O , ^{26}Si ."

3. Title: On the Periodic Redshifts of Galaxies and Associated QSOs

Authors: [R. Wayte](#)

[viXra:1101.0048](#)

Quote: "The calculated separations of many QSO-galaxy pairs have been found to fit a diffusion law distribution, which suggests that associated QSOs were ejected from parent galaxies."

VI. Stellar Evolution and Large-Scale Structure

1. Title: Does the growth of structure affect our dynamical models of the universe? The averaging, backreaction and fitting problems in cosmology

Authors: [Chris Clarkson](#), [George Ellis](#), [Julien Larena](#), [Obinna Umeh](#)

[arXiv:1109.2314](#)

Quote: “Structure occurs over a vast range of scales in the universe. Our large-scale cosmological models are coarse-grained representations of what exists, which have much less structure than there really is. An important problem for cosmology is determining the influence the small-scale structure in the universe has on its large-scale dynamics and observations. Is there a significant, general relativistic, backreaction effect from averaging over structure? One issue is whether the process of smoothing over structure can contribute to an acceleration term and so alter the apparent value of the cosmological constant. If this is not the case, are there other aspects of concordance cosmology that are affected by backreaction effects? **Despite much progress, this 'averaging problem' is still unanswered, but it cannot be ignored in an era of precision cosmology.**”

2. Title: The galaxy ancestor problem

Authors: [Mike Disney](#), [Huw Lang](#)

[arXiv:1109.2870](#)

Quote: “HST finds galaxies whose Tolman dimming should exceed 10 mag. Could evolution alone explain these as our ancestor galaxies? Or could they be representatives of quite a different dynasty whose descendants are no longer prominent today? We explore this latter hypothesis and argue that Surface Brightness Selection Effects naturally bring into focus quite different dynasties from different redshifts.”

3. Title: Inhomogeneity effects in Cosmology

Authors: [George F R Ellis](#)

[arXiv:1103.2335](#)

Quote: “This article looks at how inhomogeneous spacetime models may be significant for cosmology. First it looks at how the averaging process may affect large scale dynamics, with backreaction effects leading to effective contributions to the averaged energy-momentum tensor. Secondly it considers how local inhomogeneities may affect cosmological observations in cosmology, possibly significantly affecting the concordance model parameters. Thirdly it presents the possibility that the universe is spatially inhomogeneous on Hubble scales, with a violation of the Copernican principle leading to an apparent acceleration of the universe. This could perhaps even remove the need for the postulate of dark energy.”

4. Title: Galaxies appear simpler than expected

Authors: [M. J. Disney](#), [J. D. Romano](#), [D. A. Garcia-Appadoo](#), [A. A. West](#), [J. J. Dalcanton](#), [L. Cortese](#)

[arXiv:0811.1554](#)

Quote: “Galaxies are complex systems the evolution of which apparently results from the interplay of dynamics, star formation, chemical enrichment, and feedback from supernova explosions and supermassive black holes. The hierarchical theory of galaxy formation holds that galaxies are assembled from smaller pieces, through numerous mergers of cold dark matter. The properties of an individual galaxy should be controlled by six independent parameters including mass, angular-momentum, baryon-fraction, age and size, as well as by the accidents of its recent haphazard merger history. Here we report that a sample of galaxies that were first detected through their neutral hydrogen radio-frequency emission, and are thus free of optical selection effects, shows five independent correlations among six independent observables, despite having a wide range of properties. This implies that the structure of these galaxies must be controlled by a single parameter, although we cannot identify this parameter from our dataset. Such a degree of organisation appears to be at odds with hierarchical galaxy formation, a central tenet of the cold dark matter paradigm in cosmology.”

5. Title: The integrated Sachs-Wolfe imprints of cosmic superstructures: a problem for Λ CDM

Authors: [Seshadri Nadathur](#), [Shaun Hotchkiss](#), [Subir Sarkar](#)

[arXiv:1109.4126](#)

Quote: “A crucial diagnostic of the Λ CDM cosmological model is the integrated Sachs-Wolfe (ISW) effect of large-scale structure on the cosmic microwave background (CMB). The ISW imprint of superstructures of size $\sim 100 h^{-1}$ Mpc at redshift $z \sim 0.5$ has been detected with $>4\sigma$ significance, however it has been noted that the signal is much larger than expected. We revisit the calculation using linear theory predictions in Λ CDM cosmology for the number density of superstructures and their radial density profile, and take possible selection effects into account. While our expected signal is larger than previous estimates, it is still inconsistent by $>3\sigma$ with the observation. If the observed signal is indeed due to the ISW effect then huge, extremely underdense voids are far more common in the observed universe than predicted by Λ CDM.”

VII. Method

1. Title: Testing alternative theories of gravity using the Sun

Authors: Jordi Casanellas, Paolo Pani, Ilídio Lopes, Vitor Cardoso
[arXiv:1109.0249](#)

Quote: “We propose a new approach to test possible corrections to Newtonian gravity using solar physics. The high accuracy of current solar models and new precise observations allow one to constrain corrections to standard gravity at unprecedented levels. Our case study is Eddington-inspired gravity, an attractive modified theory of gravity which results in non-singular cosmology and collapse. The theory is equivalent to standard gravity in vacuum, but it sensibly differs from it within matter, for instance it affects the evolution and the equilibrium structure of the Sun, giving different core temperature profiles, deviations in the observed acoustic modes and in solar neutrino fluxes. Comparing the predictions from a modified solar model with observations, we constrain the coupling parameter of the theory, $|\kappa_g| < 3 \times 10^5 \text{ m}^5 \text{ s}^2 / \text{kg}$. Our results show that the Sun can be used to efficiently constraint alternative theories of gravity.”

2. Title: Neutral Hydrogen Tully Fisher Relation: The case for Newtonian Gravity

Authors: Sayan Chakraborti, Satej Khedekar
[arXiv:1109.0529](#)

Quote: “Intrinsic luminosities are related to rotation velocities of disk galaxies by Tully Fisher (TF) relations. The Baryonic TF (BTF) relation has recently been explained with Dark Matter and Newtonian Gravity as well as Modified Newtonian Dynamics (MOND). However, recent work has pointed out that the currently used BTF relation ignores the contribution from hot gas and oversimplifies complex galaxy-scale physics. In this Letter, we advocate the use of the Neutral Hydrogen TF (HITF) relationship, which is free from dust obscuration and stellar evolution effects, as a clean probe of gravity and dynamics in the weak field regime. We incorporate the physics of hot gas from supernova feedback which drives the porosity of the Interstellar Medium (ISM). A simple model that includes supernovae feedback, is generalized to include a parametrized effective gravitational force law. We test our model against a catalogue of galaxies, spanning the full range of disks from dwarf galaxies to giant spirals, to demonstrate that a Kennicutt-Schmidt (KS) law for star formation and simple Newtonian gravity is adequate for explaining the observed HI scaling relations. The data rules out MOND-like theories, within the scope of this model.”

3. Title: Testing the cosmic distance duality with X-ray gas mass fraction and supernovae data

Authors: R. S. Goncalves, R. F. L. Holanda, J. S. Alcaniz
[arXiv:1109.2790](#)

Quote: “The so-called reciprocity relation, proved long ago by Etherington (1933), is a fundamental result for observational cosmology (see, e.g., Schneider et al. 1992 and Peebles 1993 for different cosmological analyses in which the relation is directly or indirectly used). It states that if source and observer are in relative motion, solid angles subtended between them are related by geometrical invariants which involve the source redshift z measured by the observer (see Ellis 1971; 2007 and references therein) ..[...] **In reality, any consistent observational deviation from Eq.(1) would give rise to a cosmological crises** (Ellis 2007) with a clear evidence of a new physics. It is found that the La Roque et al. (2006) sample is in perfect agreement with the duality relation ($\eta = 1$) whereas the Etori et al. (2009) sample **presents a significant conflict**. However, if the results of Etori et al. sample are confirmed by other analyses for different R_{eff} values, it would bring to light new **evidence for new physics**, such as photon coupling with particles beyond the standard model of particle physics, variation of fundamental constants, absorption by dust, etc.

(see, e.g., Avgoustidis et al. (2010) and references therein for a discussion). Our results, therefore, reinforce the interest in searching for new and independent methods to test the CDDR.”

4. Title: Editorial note to "Large number coincidences and the anthropic principle in cosmology"

Authors: [George F. R. Ellis](#)

[arXiv:1105.2462](#)

Quote: “The anthropic principle is one of the most controversial proposals in cosmology. It relates to why the universe is of such a nature as to allow the existence of life. This inevitably engages with the foundations of cosmology, and has philosophical as well as technical aspects.”

5. Title: On Shear-Free perturbations of FLRW Universes

Authors: [Anne Marie Nzioki](#), [Rituparno Goswami](#), [Peter K.S. Dunsby](#), [George F. R. Ellis](#)

[arXiv:1107.5410](#) and

[arXiv:1107.3669](#)

Quote: “A surprising exact result for the Einstein Field Equations is that if pressure-free matter is moving in a shear-free way, then it must be either expansion-free or rotation-free. It has been suggested this result is also true for any barotropic perfect fluid, but a proof has remained elusive. We consider the case of barotropic perfect fluid solutions linearized about a Robertson-Walker geometry, and prove that the result remains true except for the case of a specific highly non-linear equation of state. We argue that this equation of state is non-physical, and hence the result is true in the linearized case for all physically realistic barotropic perfect fluids. This result, which is not true in Newtonian cosmology, demonstrates that the linearized solutions, believed to result in standard local Newtonian theory, do not always give the usual behaviour of Newtonian solutions.”

6. Title: An optical mechanism for aberration of starlight

Authors: [Robert A. Woodruff](#)

[arXiv:1110.4788](#)

Quote: “We present a physical-optics based theory of the physical mechanism for aberration of starlight. We apply non-relativistic and relativistic theories for wavefront image formation and include the effects of optically transmitting media within the sensor. We show that the sensors imaging properties combined with finite velocity of light fully accounts for aberration. That is, the influence of the moving sensor on the incident wavefront from the star fully explains aberration. Our treatment differs from all previous derivations because we include wavefront-imaging physics within the sensor model. Our predictions match Earth-sensor based measurements, but differ at larger sensor speeds from predictions of the special relativistic-based theory. While experimental uncertainty resulting from the low Earth-orbital velocity prevents experimental confirmation of the special relativistic model of aberration, we find that Earth-based sensors containing refractive optical media could experimentally differentiate between these competing descriptions and, in addition, yield an independent test of time dilation. We derive and present the details of such an experiment.”

Editor: The statistical biases referred to in Portinari’s paper are in fact merely measurements of observed reality, if viewed from without the preferred model. In terms of the Standard Model, Quasars’ high redshifts dictate that they should lie at enormous distances from the observer, and are therefore incredibly luminous. Consequently, they are deemed to be fuelled by Supermassive Black Holes, a supernatural instrument that allows the analyst to explain over-luminosity virtually without limit, simply by cranking up the Black Hole mass (to over 10 billion Solar Masses in some cases). Even so, Quasars remain anomalous in terms of the model.

7. Title: On the cosmological evolution of the black hole - host galaxy relation in quasars

Authors: [L. Portinari](#), [J. Kotilainen](#), [R. Falomo](#), [R. Decarli](#)

[arXiv:1110.6067](#)

Quote: “Observed quasar hosts are consistent with no evolution from the local $M(\text{BH}) - L(\text{host})$ relation, and suggest a significant increase of the mass ratio $\Gamma = M(\text{BH})/M(\text{host})$ from $z=0$ to $z=3$. **Taken at face value, this is totally at odds with the predictions** of SAM [**Editor:** SAM = Statistical Analytical Model], where the intrinsic Γ shows little evolution and quasar host galaxies at high redshift are systematically overluminous (and/or have undermassive BH). However, since quasars preferentially trace very massive black holes (10^9 - 10^{10} Msun) at the steep end of the

luminosity and mass function, the ensuing selection biases can reconcile the present SAM with the observations. A proper interpretation of quasar host data thus requires the global approach of SAM so as to account for statistical biases."

Editor: Predictably, the apparently anomalous results obtained in the OPERA neutrino experiment have led to a flurry of explanations, ranging from badly-connected optic fibre to problems with the measurement of one-way speed of light (using GPS) or uncertainties in the precision of neutrino detection. The following paper suggests that the incorrect speed for neutrinos could in principle be obtained from differences in the leading and trailing edges of the signal. The interesting point is that we are being told just why the results of an experiment set up to find support for a model are in principle unreliable and therefore meaningless. This level of scrutiny is not brought to bear if the results fit the required outcome.

8. Title: A simple explanation of OPERA results without strange physics

Authors: [Gilles Henri](#)

[arXiv:1110.0239](#)

Quote: *"We show that OPERA recent results showing an apparent superluminal velocity of muonic neutrinos can find a very simple explanation without any measurement error or any strange physics. Namely, it is enough that the beam composition varies during the leading and the trailing edges to explain an apparent time shift in the detected neutrinos. The order of magnitude of the shift will be the relative variation of the average cross-section times the rising/decaying time, and even a modest change in the composition of the beam could produce the observed effect."*

Editor: Analysis of the microwave background changed significantly with each release of COBE and WMAP results. Initially it was seen purely as isotropic primordial radiation with neither anisotropy nor contribution from astrophysical structure, as predicted by the Big Bang theory. Now anisotropies are multi-tiered and studied in their own right, with the further complication of significant contributions from foreground structures and other real and imagined non-primordial noise masking the desired signal.

9. Title: A measurement of secondary cosmic microwave background anisotropies with two years of South Pole Telescope observations

Authors: [C. L. Reichardt](#) et al

[arXiv:1111.0932](#)

Quote: *"At these frequencies and angular scales, a combination of the primary CMB anisotropy, thermal and kinetic Sunyaev-Zel'dovich (SZ) effects, radio galaxies, and cosmic infrared background (CIB) contributes to the signal. We combine Planck and SPT data at 220 GHz to constrain the amplitude and shape of the CIB power spectrum and find strong evidence for non-linear clustering. We explore the SZ results using a variety of cosmological models for the CMB and CIB anisotropies and find them to be robust with one exception: allowing for spatial correlations between the thermal SZ effect and CIB significantly degrades the SZ constraints ... Modeling uncertainties involving the astrophysics of the intracluster medium rather than the statistical uncertainty in the measured band powers are the dominant source of uncertainty on σ_8 ."*

Editor: Analysis of SNe data to derive cosmological phenomena such as accelerated expansion relies on several arbitrary assumptions, not least of which is that SNe are standard candles, and can consequently be used as distance beacons. This is analogous to Hubble's original (incorrect) assumption that galaxies are standard candles.

10. Title: Is Dark Energy Falsifiable?

Authors: [Carl H. Gibson](#), [Rudolph E. Schild](#)

[arXiv:1112.2758](#)

Quote: *"Is the accelerating expansion of the Universe true, inferred through observations of distant supernovae, and is the implied existence of an enormous amount of anti-gravitational dark energy material driving the accelerating expansion of the universe also true? To be physically useful these propositions must be falsifiable; that is, subject to*

observational tests that could render them false, and both fail when viscous, diffusive, astro-biological and turbulence effects are included in the interpretation of observations.”

Editor: The authors make a statement (highlighted below) that, while astonishing, clearly sums up the priorities in modern cosmology. The connection between observation and theory is described as *an emerging trend in contemporary space science*. Notwithstanding the introduction, it is of crucial importance to the field that we use techniques that have been honed and tested in the laboratory, and this paper is therefore important as a declaration of principles.

11. Title: The Impact of Recent Advances in Laboratory Astrophysics on our Understanding of the Cosmos

Authors: [D. W. Savin, et al](#)

[arXiv:1112.2770](#)

Quote: *“An emerging theme in modern astrophysics is the connection between astronomical observations and the underlying physical phenomena that drive our cosmos. Both the mechanisms responsible for the observed astrophysical phenomena and the tools used to probe such phenomena - the radiation and particle spectra we observe - have their roots in atomic, molecular, condensed matter, plasma, nuclear and particle physics. Chemistry is implicitly included in both molecular and condensed matter physics. This connection is the theme of the present report, which provides a broad, though non-exhaustive, overview of progress in our understanding of the cosmos resulting from recent theoretical and experimental advances in what is commonly called laboratory astrophysics. This work, carried out by a diverse community of laboratory astrophysicists, is increasingly important as astrophysics transitions into an era of precise measurement and high fidelity modeling.”*

Editor: The choice of method confounding physicists in space science is nowhere more perplexing than in the field of gravitation.

12. Title: What if ... General Relativity is not the theory?

Authors: [Orfeu Bertolami](#)

[arXiv:1112.2048](#)

Quote: *“Einstein's general theory of relativity has been scrutinized for over ninety five years and shown to describe accurately all phenomena from the solar system to the Universe. However, this success is achieved in the case of the largest scales provided one admits contributions to energy-momentum tensor involving dark components such as dark energy and dark matter. Moreover, the theory has well known shortcomings, such as the problem of singularities, the cosmological constant problem and the well known initial conditions problems for the cosmological description. Furthermore, general relativity also does not fit the well known procedures that allow for the quantization of the other fundamental interactions.”*

VIII. Black Holes

1. Title: The Black Hole Catastrophe: a Short Reply to J. J. Sharples

Authors: [Stephen J. Crothers](#)

[viXra:1111.0032](#)

Quote: *“Each of the objections are treated in turn and their invalidity fully demonstrated. Black hole theory is riddled with contradictions. This article provides definitive proof that black holes do not exist.”*

IX. CMBR

1. Title: Dominant Multipoles in WMAP5 Mosaic Data Correlation Maps

Authors: [O.V.Verkhodanov](#), [M.L.Khabibullina](#)

Quote: “The method of correlation mapping on the full sphere is used to study the properties of the ILC map, as well as the dust and synchrotron background components. An anomalous correlation of the components with the ILC map in the main plane and in the poles of the ecliptic and equatorial coordinate systems was discovered. Apart from the bias, a dominant quadrupole contribution in the power spectrum of the mosaic correlation maps was found in the pixel correlation histogram. Various causes of the anomalous signal are discussed.”

Editor: The primary problem faced by WMAP analysts is separating signal from noise. A further noise component (anything other than primordial relic radiation would be noise in model-dependent analysis) has emerged in WMAP7: It is referred to as the “galactic haze”, and is said to be diffuse radiation emanating from the galactic centre. It is a tacit admission on the part of WMAP analysts that microwave background radiation is produced to some significant degree by contemporary astrophysical structures. The questions immediately arise – what happens to the galaxian contribution from 300 billion other galaxies in the known universe? How does one strip it out? And, indeed, could the entire background fog not have been produced by post-Big Bang baryonic systems?

2. Title: Analysis of WMAP 7-year Temperature Data: Astrophysics of the Galactic Haze

Authors: [Davide Pietrobon](#), et al

[arXiv:1110.5418](#)

Quote: “We demonstrate improved performance in quantifying the diffuse galactic emission when Haslam 408MHz data are included together with WMAP7, and the spinning and thermal dust emission is modeled jointly. We also address the question of whether the hypothetical galactic haze can be explained by a spatial variation of the synchrotron spectral index. The excess of emission around the Galactic center appears stable with respect to variations of the foreground model that we study. **Our results demonstrate that the new galactic foreground component - the microwave haze - is indeed present.**”

3. Title: Template fitting of WMAP 7-year data: anomalous dust or flattening synchrotron emission?

Authors: [M. W. Peel](#), [C. Dickinson](#), [R. D. Davies](#), [A. J. Banday](#), [T. R. Jaffe](#), [J. L. Jonas](#)

[arXiv:1112.0432](#)

Quote: “**Anomalous microwave emission** at 20-40 GHz has been detected across our Galactic sky. It is highly correlated with thermal dust emission and hence it is thought to be due to spinning dust grains. Alternatively, this emission could be due to synchrotron radiation with a flattening (hard) spectral index.”

4. Title: Foreground Analysis Using Cross-Correlations of External Templates on the 7-year WMAP data

Authors: [Tuhin Ghosh](#), [A.J. Banday](#), [Tess Jaffe](#), [Clive Dickinson](#), [Rod Davies](#), [Richard Davis](#), [Krzysztof Gorski](#)

[arXiv:1112.0509](#)

Quote: “The **anomalous microwave emission** associated with dust is detected at high significance in most of the 33 fields studied. The anomalous emission correlates well with the Finkbeiner et al. (1999) model 8 predictions (FDS8) at 94 GHz, and is well described globally by a power-law emission model with an effective spectral index between 20 and 60 GHz of $\beta \approx -2.7$. It is clear that attempts to explain the emission by spinning dust models require multiple components, which presumably relates to a complex mix of emission regions along a given line-of-sight.”

X. MOND

1. Title: MOND's acceleration scale as a fundamental quantity

Authors: [T. Bernal](#), [S. Capozziello](#), [G. Cristofano](#), [M. De Laurentis](#)

[arXiv:1110.2580](#)

Quote: “Some quantum-cosmic scaling relations indicate that the MOND acceleration parameter a_0 could be a fundamental quantity ruling the self-gravitating structures, ranging from stars and globular clusters up to superclusters of galaxies and the whole observed universe. We discuss such coincidence relations starting from the Dirac quantization condition ruling the masses of primordial black holes.”

2. Title: MOND--particularly as modified inertia

Authors: [Mordehai Milgrom](#)

[arXiv:1111.1611](#)

3. Title: The Real Problem with MOND

Authors: [Scott Dodelson](#)

[arXiv:1112.1320](#)

Quote: "Gravitational potentials in the cosmos are deeper than expected from observed visible objects, a phenomenon usually attributed to dark matter, presumably in the form of a new fundamental particle. Until such a particle is observed, the jury remains out on dark matter, and modified gravity models must be considered. The class of models reducing to MODified Newtonian Dynamics (MOND) in the weak field limit does an excellent job fitting the rotation curves of galaxies, predicting the relation between baryonic mass and velocity in gas-dominated galaxies, and explaining the properties of the local group. Several of the initial challenges facing MOND have been overcome, while others remain. Here I point out the most severe challenge facing MOND."