The Alternative Cosmology Group Newsletter - April 2009

The 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 1,052 papers published under astro-ph on arXiv for the month of March, 2009. If you have suggestions of papers you may have come across, please send them to Hilton or Eric.

Results in modern astrophysics depend increasingly upon assumptions. One of the mysteries contained in the Standard Model of Cosmology concerns entropy. The conventional understanding of thermodynamics suggests that entropy is the irresistible destiny of any physical system. Entropy is defined conceptually as *"a lack of pattern or order."* Big Bang theory describes a scenario unfolding in the opposite direction: From a primordial, high-entropy, isotropic, grey-matter soup, the imperatives driving the Universe combine particles in an upwardly mobile hierarchy, forming structure at larger and larger scales. This would appear to conflict with the laws of thermodynamics. However, there may be an explanation, depending upon assumptions. Paul Frampton of the University of North Carolina suggests that, *"One percent by mass of dark energy can provide ninety-nine percent of total entropy."* (**arXiv:0903.0113**) The question that remains, then, is what happens to entropy in the current Big Bang Universe, where Dark Energy accounts for more than 70% of mass?

Structure

Francesco Sylos Labini teamed up with Yurij Baryshev and Nikolay Vasilyev to show that large-scale structure seen in the SDSS causes headaches for the LCDM model. The principle of scientific investigation that requires a model invalidated by observation to be modified or abandoned is ignored by contemporary cosmology. *"One of the most striking features predicted by standard models of galaxy formation is the presence of anti-correlations in the matter distribution at large enough scales ($r > r_c$)…[]… However we show that the large scale behaviour of $\xi(r)$ is affected by systematic volume-dependent effects which make the detection of correlations to be only an estimate of a lower limit of their amplitude, spatial extension and statistical errors. We also show that because of the same systematic effects, the scale signalling the real space counterpart of the baryon acoustic oscillations is located, if* *present at all, at scales larger than 250 Mpc/h. These results are challenging for any model of structure formation."*

Title: Absence of anti-correlations and of baryon acoustic oscillations in the galaxy correlation function from the Sloan Digital Sky Survey DR7

Authors: Francesco Sylos Labini, Nikolay L. Vasilyev, Yurij V. Baryshev
arXiv:0903.0950

Black Holes

Astronomer Royal, Lord Martin Rees, joined up with an impressive group of astronomers to produce the following study. It is a good example of the intransigent assumption of cosmological objects that have never been seen, and, it would seem in the light of several recent works, cannot exist even theoretically.

[13] **Title: Massive Black Holes Across Cosmic Time**
Authors: P. Madau , et al
arXiv:0903.0097

MOND

One view of MOND:

"Sanders (2003) argued that MOND's prediction of more mass does not constitute the falsification of MOND because there might be other forms of matter in the system that are not visible (such as neutrinos). His argument is that if MOND predicts less mass than is observed, then it will be a definite falsification of MOND. More mass can always be found, but it is difficult to make observed mass disappear…The fact that MOND predicts less mass provides a potential problem for MOND".

100] **Title: Testing of MOND with Local Group Timing**
Author: Yan-Chi Shi
arXiv:0903.0591

Another view of MOND:

The inherent limitations of non-relativistic MOND were addressed by Benkenstein after Sanders with Tensor-Vector-Scalar (TeVeS) cosmological theory. It has both enhanced predictive ability and tighter observational fit than the LCDMM.

[646] **Title: The Tensor-Vector-Scalar theory and its cosmology**
Author: Constantinos Skordis
arXiv:0903.3602

Expansion

Physicists have to dig deep to explain expansion. Even GRT is coming under the magnifying glass. *"The discovery that the cosmic expansion is accelerating has been followed by an intense theoretical and experimental response in physics and astronomy. The discovery implies that our most basic notions about how gravity works are violated on cosmological distance scales. One simple fix is the introduction of a cosmological constant into the field equations for general relativity. However, the extremely small value of the cosmological constant, relative to theoretical expectations, has led theorists to explore a wide variety of alternative explanations that involve* ***the introduction of an exotic negative-pressure fluid or a modification of general relativity."***

158] **Title: The Physics of Cosmic Acceleration**
Authors: Robert R. Caldwell, Marc Kamionkowski
arXiv:0903.0866

CMBR

In an impressive show of solidarity, 177 scientists co-signed a white paper entitled *Observing the Evolution of the Universe*. The prospect is tantalising—actually observing the unfolding history of the cosmos is unprecedented and would clearly answer the most pressing questions facing cosmologists. They describe their achievements: "*Through detailed measurements one may address everything from the physics of the birth of the universe to the history of star formation and the process by which galaxies formed. One may in addition track the evolution of the dark energy and discover the net neutrino mass.*" Where would they have found all this? In the fine structure of the Cosmic Microwave Background Radiation.

[167] **Title: Observing the Evolution of the Universe**
Authors: James Aguirre, et al (177 authors in all!)
arXiv:0903.0902

However, as we have seen in innumerable studies, extracting cosmological meaning from the CMBR is fraught with difficulties and anomalies. One of the reasons why the results of WMAP5 were unexpected is attributed to the violation of parity and symmetry called Cosmic Birefringence, a continuous rotation of the polarisation plane of light. *"The standard cosmological model is assumed to respect parity symmetry. Under this assumption the cross-correlations of the CMB's temperature anisotropy and 'gradient'-like polarization, with the 'curl'-like polarization identically vanish over the full sky. Recently, the degree of parity violation (reflected in polarization rotation) was constrained using data from BOOMERANG, WMAP and QUAD."* The authors are quite open about the necessity for non-standard physics in their analysis: *"Before we describe the effect of non-standard physics on the CMB, let us first review the basics of the CMB statistics in the standard cosmological model because detecting this physics relies on deviations from the standard statistics of the CMB."*

[203] **Title: CMB Polarization Systematics Due to Beam Asymmetry: Impact on Cosmological Birefringence**

Authors: N.J. Miller, M. Shimon, B.G. Keating
arXiv:0903.1116

No matter which way we analyse WMAP data, the most obvious disagreement with the requirements of BBT is that of significant dipole anisotropy. The Standard Model cannot accommodate it.

"Motivated by the recent results of Hansen et al. (2008) concerning a noticeable hemispherical power asymmetry in the WMAP data on small angular scales, we revisit the dipole modulated signal model introduced by Gordon et al…[]…Thus, we find that the evidence for a dipole power distribution in the WMAP data increases with ℓ in the 5-year WMAP data set, in agreement with the reports of Hansen et al. (2008)."

[221] **Title: Increasing evidence for hemispherical power asymmetry in the five-year WMAP data**
Authors: J. Hoftuft, H. K. Eriksen, A. J. Banday, K. M. Gorski, F. K. Hansen, P. B. Lilje
arXiv:0903.1229

Cosmological Models

Logically, we can find a great many causal solutions that fit the current Standard Model. Following Occam's razor, we would expect the simplest, least adorned theory to triumph.

"The LCDM standard model, although an excellent parameterisation of the present cosmological data, requires two as yet unobserved components, Dark Matter and Dark Energy, for more than 95% of the Universe, and a high level of fine-tuning. Faced to this unsatisfactory situation, we study an unconventional cosmology, the Dirac-Milne universe, a matter-antimatter symmetric cosmology, in which antimatter is supposed to present a negative active gravitational mass…[]…This simple model, without any adjustable parameter or need for Dark Matter or Dark Energy, is a reminder that we should look for simpler and more motivated cosmological models than the present LCDM standard model."

[431] Title: Do we live in a "Dirac-Milne" universe?
Authors: Aurélien Benoit-Lévy, Gabriel Chardin
arXiv:0903.2446

Assuming the Standard Model inevitably brings difficulties for cosmological modelling. In this case, dust at high redshift. *"We also use our dust evolution models to examine the origin of dust at redshifts > 6, when only supernovae and their remnants could have been, respectively, their sources of production and destruction. Our results show that unless an average supernova (or its progenitor) produces between 0.1 and 1 $M_\odot$ (solar mass) of dust, alternative sources will need to be invoked to account for the massive amount of dust observed at these redshifts."*

Of course, there is the alternative explanation that high-z does not necessarily represent an early Universe.

[3] **Title: The Cycle of Dust in the Milky Way: Clues from the High-Redshift and Local Universe**
Authors: Eli Dwek, Frederic Galliano, Anthony Jones
arXiv:0903.0006

Redshift

The expected correlation between redshift and age of systems is constantly challenged by studies showing both mature structures at high z and young structures at low z, contrary to the requirements of the LCDM model. The authors state, *"Blue early-type galaxies represent a fascinating phase in the evolution of galaxies. Quite what place they take in the overarching picture is still unclear. There are three general scenarios that might account for them. They could represent the result of a spiral-spiral merger whose end-product will eventually join the red sequence in passive evolution. They might also be early-type galaxies on the red sequence that are undergoing an episode of star formation due to the sudden availability of cold gas, making them leave the red sequence before rejoining it. The third possibility is that they are mixed early-type/late-type mergers, meaning that one progenitor originates from each the blue cloud and the red sequence. Which of these scenarios— or which combination thereof— is occurring here is unclear."* There is of course a fourth possibility, which the authors seem disinclined to consider: That early-type galaxies are in fact early galaxies.

[611] **Title: Galaxy Zoo: A sample of blue early-type galaxies at low redshift**
Authors: Kevin Schawinski, et al.
arXiv:0903.3415

In one of the most important declarations of intent in recent times, Eric Bell and colleagues laid out the mainstream approach to galaxy astrophysics. Model-dependent bias is clear from the outset, as are the assumptions upon which such studies will ostensibly be based over the next decade or so at least.

"In order to link galaxy populations at different redshifts, we must not only characterize their evolution in a systematic way, we must establish which physical processes are responsible for it…[]…Galaxy redshifts out to z ~ 1.4 can be obtained from optical spectra. At higher redshifts, the doublet [OII]λ3727 is no longer accessible with standard optical spectrographs and one enters the so-called 'redshift desert' …[]…One cannot begin to study the evolution of galaxies unless one has some idea of the redshift at which they lie. With broadband imaging data alone, one must resort to photometric redshifts. The standard method is to fit the photometry to a set of template spectra, drawn from population synthesis models or using the observed SEDs of low-redshift galaxies. ***The problem lies in the appropriate choice of templates.*** *The galaxy population evolves strongly, so templates constructed from low-redshift galaxies do not necessarily match very well at high redshift. If one uses models, then one has to worry whether these are a good representation of real galaxies, how to introduce* ***corrections for dust****, and so on."*

Title: **Understanding the Astrophysics of Galaxy Evolution: the role of spectroscopic surveys in the next decade**

Authors: Eric Bell, et al
arXiv:0903.3404

Van Flandern, Lerner, and others have cast doubt upon the reliability of 1A SNe as standard candles, to the extent that the usefulness of SNe in determining the distance modulus is severely curtailed. The recent discovery of intergalactic dust, with the implication that the IGM is only imperfectly transparent, further weakens the case for SN cosmology. Note that Ryan Scranton (*Evidence for the Big Bang*, with Björn Feuerbacher) is co-author of the following paper. *"Supernova measurements have become a key ingredient in current determinations of cosmological parameters. These sources can however be used as standard candles only after correcting their apparent brightness for a number of effects. In this paper we discuss some limitations imposed by the formalism currently used for such corrections and investigate the impact on cosmological constraints. We show that colour corrections are, in general, expected to be biased."*

[761] **Title: On the impact of intergalactic dust on cosmology with type Ia supernovae**
Authors: Brice Ménard, Martin Kilbinger, Ryan Scranton
arXiv:0903.4199

Quasars

The SDSS and 2DF surveys have provided an extensive data set for quasar analysis. Two schools of thought dominate the results: On the one hand, the non-standard interpretation, led by Halton Arp, and supported by Martin Lopez-Corredoira, the Burbidges, Jack Sulentic, and others, provides straightforward classical interpretation of observation without model-dependent filtering; and, in stark contrast, those that assume the LCDM expansion model and attempt to fit observations to it. The following paper (using the latter class of analysis) clearly illustrates the difference in approach. Assumptions in this paper, other than the obvious axiom of universal Hubble-type expansion, include absolute magnitude scaled at redshift distance; extreme remoteness; Black Hole energy; and Dark Matter halos. (Note the participation of Dr Neta Bahcall, who had previously appealed for a *what-you-see-is-what-you-get* approach).

[575] **Title: Clustering of Low-Redshift (z <= 2.2) Quasars from the Sloan Digital Sky Survey**
Authors: Nicholas P. Ross, Yue Shen, Michael A. Strauss, Daniel E. Vanden Berk, Andrew J. Connolly, Gordon T. Richards, Donald P. Schneider, David H. Weinberg, Patrick B. Hall, Neta A. Bahcall, Robert J. Brunner
arXiv:0903.3230