The Alternative Cosmology Group Newsletter - March 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 1,006 papers published under astro-ph on arXiv for the month of February, 2009. If you have suggestions of papers you may have come across, please send them to Hilton or Eric.

The fundamental property of Big Bang Theory in all its incarnations is that of universal *expansion*, especially the LCDM model. LCDM does not address thorny issues like creation *ex nihilo*, singularity, and infinite quantities, and therefore cannot be criticised on that basis. Do we have evidence of expansion? It would seem to depend on what we mean by "astrophysics". The following 94-page exposition of plasma astrophysics is a must-read for cosmologists.

"It is important to note, that the taking into account of the gravity-induced electric polarization leads to the other conceptual changes. For instance, it rejects the collapse mechanism of stars at the last stage of their evolutions and hereunder puts the question about a mechanism of the 'black hole' formation. Thereby, at taking into account the gravity-induced effects in plasma, we must refuse some models, which are commonly accepted today and seem obvious. The process of a refusing can be painful for a conservative part of astrophysical community. But this refusing is completely justified and absolutely necessary. Only herewith the quantitative explanation can be obtained for all corresponding measurement data without using of a any fitting parameter. The star physics obtains herewith the reliable foundation in the manner of result of these measurements, as a physical science must have."

Title: Astrophysics from the physical point of view

Author: B.V.Vasiliev
arXiv:0902.0711

On the other hand, taking a non-physical approach to astrophysics (which is surely a contradiction in itself) brings enormous problems. In the following paper, the suggested solutions seem to exceed the absurdity of the original

problem. *"The inflationary paradigm, although very successful phenomenologically, suffers from several conceptual problems which motivate the search for alternative scenarios of early universe cosmology. Here, two possible alternatives will be reviewed. - "string gas cosmology" and the "matter bounce". Their successes and problems will be pointed out."*

Title: Alternatives to Cosmological Inflation
Author: Robert H. Brandenberger
arXiv:0902.4731

CMBR

Explanations of the microwave background and reports of patterns discovered there continue to become more and more far-fetched. The existence of esoteric metaphysical theories in analyses are troublesome for anyone attempting to analyse WMAP data because these prior arguments must be taken into consideration before any new ideas or conventional physics can be brought to bear. This team concludes that the microwave haze is in fact a foreground synchrotron effect. You will recall that Joe Silk was featured in last month's newsletter as well. "*Observations by the Wilkinson Microwave Anisotropy Probe (WMAP) satellite have identified an excess of microwave emission from the centre of the Milky Way. It has been suggested that this WMAP haze emission could potentially be synchrotron emission from relativistic electrons and positrons produced in the annihilations of one (or more) species of dark matter particles."*

Title: Can the WMAP Haze really be a signature of annihilating neutralino dark matter?

Authors: Daniel T. Cumberbatch, Joe Zuntz, Hans Kristian Kamfjord Eriksen, Joe Silk
arXiv:0902.0039

Galaxy rotation

Perceived anomalies in galaxy rotation curves have had physicists scrambling for answers, and led to a stream of solutions that bend the fundamentals of physics. This paper appears only in French. Here follows an English translation of the abstract: *"To the astrophysicist faced with the puzzle of dark matter, this one appears under two different aspects: on the one hand in cosmology, i.e. at very large scales, where it seems to be made of a bath of particles; on the other hand at the scale of galaxies, where it is described by a set of specific phenomena, looking incompatible with a description in terms of particles, and suggesting that we are seeing a modification of the law of*

gravity. Reconciling these two distinct aspects of dark matter in a single theoretical formalism is an important challenge which could lead to some new physics in action at astronomical scales."

Title: Modified gravity or modified matter ?
Author: Luc Blanchet

arXiv:0902.1712

This is another example of stretching for answers.

Title: Dark Halo or Bigravity?

Author: Nicola Rossi
arXiv:0902.0072

Salucci and Martins admit that the problem is not easily explained, even with non-baryonic Dark Matter. They take an intriguing first step towards the Gallo and Feng model of galaxy rotation, which involves only the relatively simple redistribution of baryonic dull matter in the galaxy disk.
"In the past years a wealth of observations has unraveled the structural properties of the Dark and Luminous mass distribution in spirals. These have pointed out to an intriguing scenario not easily explained by present theories of galaxy formation. The investigation of individual and coadded objects has shown that the spiral rotation curves follow, from their centers out to their virial radii, a Universal profile (URC) that arises from the tuned combination of a stellar disk and of a dark halo. The importance of the latter component decreases with galaxy mass. Individual objects, on the other hand, have clearly revealed that the dark halos encompassing the luminous discs have a constant density core. This resulting observational scenario poses important challenges to presently favored theoretical LCDM Cosmology…[]…These discrepancies have triggered many alternatives to the strict LCDM-NFW paradigm, some of them related to the process of galaxy formation and some to the very nature of the dark particle. Furthermore, also new fundamental physics has been invoked. From an empirical point of view, the distribution of luminous and dark matter in galaxies shows amazing properties and a remarkable systematics that is bound to play a decisive role in shaping how LCDM-based theories of galaxy formation must be modified in order to meet with the challenges that observations pose".

Title: The mass distribution in Spirals
Authors: Paolo Salucci, Christiane Frigerio Martins
arXiv:0902.1703

Redshift

Francesco Sylos-Labini teamed up with Nikolay Vasiliyev and Yurij Baryshev to produce an important analysis of the redshift distribution of galaxies. Their findings present difficulties for the Standard Model. *"We show that the estimation of fluctuation amplitude normalized to the sample density is biased by systematic effects, which we discuss in detail. We consider the type of fluctuations predicted by standard cosmological models of structure formation in the linear regime and, to study nonlinear clustering, we analyze several samples of mock-galaxy catalogs generated from the distribution of dark matter in cosmological N-body simulations. In this way we conclude that the galaxy fluctuations present in these samples are too large in amplitude and too extended in space to be compatible with the predictions of the standard models of structure formation."*

Title: Large-scale fluctuations in the distribution of galaxies from the Two Degree Field Galaxy Redshift Survey

Authors: Francesco Sylos Labini, Nikolay L. Vasilyev, Yurij V. Baryshev
arXiv:0902.0229

The Integrated Sachs-Wolfe effect is used extensively in cosmology, and is often raised in support of expanding space. However, this study indicates how error-ridden such techniques can be: *"We show that linear redshift distortions in the galaxy distribution can affect the ISW galaxy temperature signal, when the galaxy selection function is derived from a redshift survey. We find this effect adds power to the ISW signal at all redshifts and is larger at higher redshifts. Omission of this effect leads to an overestimation of the dark energy density as well as an underestimation of statistical errors."*

The Effect of Redshift Distortions on the Integrated Sachs-Wolfe Signal

Author: Anais Rassat
arXiv:0902.1759

Structure distribution

The first analysis of high redshift ($0.47 < z < 1.5$) galaxy distribution in the GOODS survey has been published. A number of anomalies are uncovered. Firstly, there is a marked difference in distribution North and South, in violation of the Cosmological Principal, and in line with other surveys and the CMBR power spectrum. Secondly, the distribution remains constant over the redshift range, that is, no evolution with redshift. *"Our most striking result is that at redshifts up to about $z = 1.5$ the form of the spatial galaxy distribution function is remarkably similar to its form at the present time. Both these forms were predicted by the gravitational statistical mechanics*

and thermodynamics of the cosmological many-body system. This indicates that although merging and dark matter can be important for the evolution of individual galaxies, they do not dominate the forms of the large scale galaxy distribution. The reasons for this lack of dominance may be able to place important constraints on merging and dark matter."

Title: The Spatial Distribution Function of Galaxies at High Redshift

Authors: Hadi Rahmani, William C. Saslaw, Saeed Tavasoli
arXiv:0902.1103

Plasma cosmology

The Cinderella role of plasma astrophysics seems to be getting its glass slipper. Magnetism has long been recognised in cosmological systems, and the necessary following step of acknowledging that magnetism does not exist without electricity is being taken by several teams of investigators, including these:
"The major questions relevant to star and planet formation are: What controls the rate, efficiency, spatial clustering, multiplicity, and initial mass function of star formation, now and in the past? What are the major feedback mechanisms through which star formation affects its environment? What controls the formation and orbital parameters of planets, especially terrestrial planets? These questions cannot be fully addressed without understanding key magnetohydrodynamics (MHD) and plasma physics processes. Although some of these basic problems have long been considered intractable, attacking them through a combination of laboratory experiment, theory, and numerical simulation is now feasible, and would be fruitful. Achieving a better understanding of these processes is critical to interpreting observations, and will form an important component of astrophysical models. These models in turn will serve as inputs to other areas of astrophysics, e.g. cosmology and galaxy formation."

Title: Plasma Astrophysics Problems in Star and Planet Formation
Authors: Ellen Zweibel, Jeremy Goodman, Hantao Ji, Alex Lazarian
arXiv:0902.3617

"Macroscopic plasma polarization, which is created by gravitation and other mass-acting (inertial) forces in massive astrophysical objects (MAO) is under discussion. Non-ideality effect due to strong Coulomb interaction of charged particles is introduced into consideration as a new source of such polarization. Simplified situation of totally equilibrium isothermal star without relativistic effects and influence of magnetic field is considered."

Title: Plasma Polarization in Massive Astrophysical Objects
Author: Igor Iosilevskiy

arXiv:0902.2386

Russel Kulsrud, co-author of the following paper, wrote the standard text *"Plasma Physics for Astrophysics"* (Princeton University Press, 2005). The abstract of the current paper says, "*We discuss the outstanding issues of the interstellar medium which will depend on the application of knowledge from plasma physics. We particularly advocate attention to recent developments in experimental plasma physics, and urge that the astronomical community consider support of these experiments in the next decade.*"

Title: Plasma Physics Processes of the Interstellar Medium
Authors: Steven Spangler, Marijke Haverkorn, Thomas Intrator, Russell Kulsrud, Alex Lazarian, Seth Redfield, Ellen Zweibel
arXiv:0902.4181

Cosmology

The abundance of dark matter satellites and subhalos, the existence of density cusps at the centres of dark matter halos, and problems producing realistic disk galaxies in simulations are issues that have raised concerns about the viability of the standard cold dark matter (LCDM) scenario for galaxy formation.

Title: Cosmology: small scale issues
Author: Joel R. Primack
arXiv:0902.2506

In 2001, Prof Wolfgang Kundt of the Universität Bonn published a little book simply called *"Astrophysics – A New Approach"*(Springer, Berlin, 2nd edition 2004). It was to become a standard text for astrophysicists who sought to work in the field empirically rather than theoretically. In 2008, Prof Kundt contributed a key chapter to the anthology edited by Martin Lopez-Corredoira and Carlos Perelman: *"Against the Tide"* (Universal Publishers, Boca Raton, 2008). Now he has published a paper entitled *"Critical Thoughts on Cosmology"*. It asks some difficult questions of the LCDM model: *"…these edited lecture notes deal with the following four special problems: (1) They advertise Wiltshire's result – making 'dark energy' obsolete – that accelerated cosmic expansion may be an artefact, due to an incorrect evaluation of the cosmic timescale in a Universe whose bulk matter is inhomogeneously distributed. (2) They cast doubt on Hawking's prediction of blackhole evaporation. (3) They point at various inconsistencies of the black-hole paradigm, in favour of nuclear-burning central engines of AGN. (4) They re-interpret (a best case of) 'anomalous redshifts' as non-cosmological, kinematic redshifts in strong jet sources."*

Title: Critical Thoughts on Cosmology
Author: Wolfgang Kundt

arXiv:0902.3151

MOND

The LCDM model expects the non-linear, hierarchical formation of structure, that is, the successive merging of small structures. We should therefore see collisions of objects, and the collisional speed would constrain the gravitational model. A study of high-speed galactic colliders reveals a better fit for MOND than for the LCDM model. *"Within the limitations of our simulations, we find that there are substantial differences in the collision velocity of objects in the standard model of cosmology and its (possible) MONDian counterpart. We observe a much greater likelihood for high-speed collisions in MOND and therefore argue that this statistic can be used as a discriminator for the two competing theories."*
The same authors developed an analogue of the Poisson's equation, with which *"…we find that the large-scale structure evolution is faster in our revised MOND model leading to an even stronger clustering of galaxies, especially when compared to the standard LCDM paradigm."*

Title:Physics of galactic colliders: high speed satellites in LCDM vs MONDian cosmology

Authors: Claudio Llinares, HongSheng Zhao, Alexander Knebe
arXiv:0902.3010