Alternative Cosmology Group Newsletter - April 2008

Posted April 8, 2008

Editor's Note: this newsletter covers papers posted from Jan. 1 to date.

Are old galaxies smaller, bigger or neither?

Three new papers on galaxy size deepen the contradiction between expanding-universe predictions and measurements. Van Dokkum et al look at very massive galaxies at a redshift of about 2.3 and find that on average they are 5- 6 times smaller in radius and hundreds of times denser than massive galaxies in today's universe. The densest of these high-z galaxies have densities five times that of any galaxies that now exist. The authors speculate that perhaps mergers may result in less dense galaxies, but mergers would also result in more massive galaxies, and some of the high-z galaxies are as massive already as the most massive galaxies observed today. So, if they merged, they would create galaxies larger than any we see. Since massive galaxies are easy to find, getting rid of either extremely massive or extremely dense galaxies is difficult, akin to hiding an elephant under a rug.

Sirocco et al confirm these results, reporting that at z=1.5 the surface brightness of galaxies, as determined with the conventional cosmology assumptions, is 2.5 magnitudes brighter than for nearby galaxies, which implies that, for a given luminosity, the galaxies have radii that are 3.2 times smaller.

On the surface, these results, taken in the context of conventional cosmology imply that smaller galaxies form first and then merge into larger ones. But more and more observations are showing that the oldest galaxies are the largest ones. Rakos et al find that in cluster galaxies that the most massive galaxies are the oldest ones, exactly the opposite of what would be expected if they are formed by merger of smaller galaxies. In addition, they find that galaxies in more massive clusters are also older, implying the clusters formed before the galaxies, again contradicting the conventional ideas of mass accumulating "bottom-up".

To add to the puzzles presented by these papers, the average ages of the stellar populations measured by Rakos extend all the way up to the standard "age of the universe" of almost 14 Gy. This is a problem, since even in elliptical galaxies, there is some star formation going on. Since some stars in these populations are a lot younger than 14 Gy, there must be some older than 14Gy for the average to be that age. This creates the conundrum of having stars older than the universe.

These puzzle all find easy resolution if the universe is not in fact expanding. In a non-expanding universe, a galaxies physical size is proportional to its angular size times the redshift. If this formula is used for the samples studies by van Dokkum and Sirroco, rather than the formula based on the expanding universe, the galaxy sizes are almost exactly the same at high redshift as at the present time. As well, if the universe is not expanding, and there was no Big Bang, stars can be older than 14 Gy.

Confirmation of the remarkable compactness of massive quiescent galaxies at z~2.3: early-type galaxies did not form in a simple monolithic collapse
Authors: Pieter van Dokkum, Marin Franx, Mariska Kriek, Bradford Holden, Garth Illingworth, Daniel Magee, Rychard Bouwens, Danilo Marchesini, Ryan Quadri, Greg Rudnick, Edward Taylor, Sune Toft
http://arxiv.org/abs/0802.4094v1

The evolution of the morphological scale of early-type galaxies since z=2
Authors: P. Saracco, M. Longhetti, S. Andreon, A. Mignano (INAF - Osservatorio Astronomico di Brera)
http://arxiv.org/abs/0801.2269v1

The Age of Cluster Galaxies from Continuum Colors
Authors: K. Rakos (UVienna), J. Schombert (UOregon), A. Odell (NAU)
http://arxiv.org/abs/0801.3665v1

Dark matter gets dimmer

Yet another well-funded search for dark matter (non-baryonic) particles has come up with a negative result. The very large Cryogenic Dark Matter Search collaboration reported zero events from a nine-month run, attempting to detect WIMPs (weakly interacting particles) in germanium. This latest in a 30-year string of negative results has not, however, led to the collaborators to conclude that WIMPs do not exist, but merely that there are further limits on WIMP masses and interaction cross-sections.

Conventional cosmology contends that there is far more gravitating mass in the universe than can be accounted for by ordinary matter and that the difference must consist of dark matter. However, Makarov and Karachentsev measure the amount of gravitating matter in groups of galaxies, including clusters, within the local Supercluster. They find that the total density of gravitating matter is only one quarter the amount predicted by the "concordance cosmology". In terms of the omega, the ratio of density to the critical density of the universe, the observed omega =0.07 compared with the predicted omega=0.27. Put another way, the mass-to-light ratio for the supercluster is 26 times the mass-to-light ratio of the sun. Since the stars in spiral galaxies have mass-to=light ratios of about 5 and in many clusters there is five times as much free plasma as there is mass in the galaxies, the measured amount of matter may well be accounted for by ordinary matter, obviating any need for dark matter.

A Search for WIMPs with the First Five-Tower Data from CDMS
Authors: CDMS Collaboration
http://arxiv.org/abs/0802.3530v2

Dark Matter Problem in the Local Supercluster
Authors: D. Makarov, I. Karachentsev
To appear in the proceedings of the IAU Symposium 244 "Dark Galaxies and Lost Baryons", Cardiff 25-29 June 2007, eds. J.I. Davies & M.J. Disney
http://arxiv.org/abs/0801.0043v1

Large-scale structure—can it fit in the conventional framework?

Conventional cosmology assumes that the distribution of matter in the universe is homogenous on the largest scales. However, some evidence shows that it is in fact fractal and in any case that giant voids 100 Mpc across or bigger are too big to have formed since the big bang. Two papers address these questions. Thieberger and Célérier use data from the SDSS catalog to determine that the distribution of galaxies in the distance range from 20-70 Mpc does seem to be fractal, the distribution converges on homogeneity—a fractal dimension of 3—at distance above 70 Mpc. However, the sample used only extends to 125 Mpc, so shows homogeneity for a relatively narrow range of distances. Bigger surveys would be needed to see if homogeneity continues to larger scales or is just a "plateau" in a larger-scale fractal distortion.

It is well known that structure does exist on larger scales-- voids have been observed that are as large as 140 Mpc across. It is hard to see how such large voids could form, but Schild and Gibson argue that a modification of Big Bang theory to take into account plasma interactions in the period 30-300,000 years after the Big Bang could form such voids as well as vortices that explain the alignments observed in the CBR. Their hydro-gravitational theory hover, must also explain how the existence of large-scale vortices in the Big Bang model would not have created very large anisotropies in the CBR, which are not observed.

Scaling Regimes as obtained from the DR5 Sloan Digital Sky Survey
Authors: Reuben Thieberger, Marie-Noëlle Célérier
http://arxiv.org/abs/0802.0464v1

Goodness in the Axis of Evil
Authors: Rudolph E. Schild, Carl H. Gibson
http://arxiv.org/abs/0802.3229v1

Cluster shadowing debate continues

If the CBR was generated by the Big Bang, the plasma in clusters of galaxies should cast shadows—dim spots—in the CBR by a process know as the Sunyaev-Zeldovich effect or SZ effect. Some studies, as reported in earlier newsletters, have indicated that the predicted shadows do not exist. Hover, Atrio-Barandela et al claim that they have detected the SZ effect in a sample of 700 clusters. So far, no papers have attempted to explain the differing results.

Measurement of the electron-pressure profile of galaxy clusters in Wilkinson Microwave Anisotropy Probe (WMAP) 3-year data
Authors: F. Atrio-Barandela, A. Kashlinsky, D. Kocevski, H. Ebeling
http://arxiv.org/abs/0802.3716v1

More on CBR non-Guassianity

In a somewhat similar conflict on the CBR, more papers continue to report non-Guassianity (non-randomness) in the distribution of CBR anisotropies, even though large collaborations continue that the CBR is Gaussian. Inflation theory, a key component of conventional cosmology predicts Gaussianity. McEwen et al find non-Guassianity in the Five-Year WMAP results, but contend that the non-randomness is limited to a few spots on the sky. Genova-Santos et al study one such spot, a cold spot in Corona Borealis and conclude that there is only a 0.19% chance of such a spot in a Gaussian CMB. However, (such is the force of ideology), they conclude from this that the cold spot cannot be caused by the "primordial" CMB, which has to be Gaussian. Instead they conclude that it must be caused by an unobserved body of gas through the SZ effect.

Editors comment: The refusal of Genova-Santos et al to take the observation of non-Guassianity in the CBR as a test of the prediction of inflationary theory that the CMB must be Gaussian and instead to take the Gaussianity of the CMB as a given because it is predicted by theory is symptomatic of the abandonment of basic scientific method that increasingly afflicts cosmology.

A high-significance detection of non-Gaussianity in the WMAP 5-year data using directional spherical wavelets
Authors: J. D., M. P. Hobson, A. N. Lasenby, D. J. Mortlock
http://arxiv.org/abs/0803.2157v1

Observations of the Corona Borealis supercluster with the superextended Very Small Array: further constraints on the nature of the non-Gaussian CMB cold spot
Authors: Ricardo Genova-Santos, Jose Alberto Rubino-Martin, Rafael Rebolo, Richard A. Battye, Francisco Blanco, Rod D. Davies, Richard J. Davis, Thomas Franzen, Keith Grainge, Michael P. Hobson, Anthony Lasenby, Carmen P. Padilla-Torres, Guy G. Pooley, Richard D.E. Saunders, Anna Scaife, Paul F. Scott, David Titterington, Marco Tucci, Robert A. Watson
http://arxiv.org/abs/0804.0199v1

MOND reviews

Finally, two papers provide useful reviews of the attempts of researchers to use MOND, Modified Newtonian Dynamics, as an alternative explanation to dark matter and other aspects of conventional cosmology

The MOND paradigm
Authors: Mordehai Milgrom (Weizmann Institute)
http://arxiv.org/abs/0801.3133v2

An Uneven Vacuum Energy Fluid as Λ, Dark Matter, MOND and Lens
Authors: HongSheng Zhao
http://arxiv.org/abs/0802.1775v3