Machine Assisted Thought

Michael J. Kurtz
Harvard-Smithsonian Center for Astrophysics
Collaborators

Alberto Accomazzi
Edwin Henneken
Jay Luker
Giovanni DiMilla
Carolyn Grant
Force11.org

Lee Dirks
Three Papers

• 2012arXiv1209.1318K
  – Finding and Recommending Scholarly Articles

• 2011ApSSP...1...23K
  – The Emerging Scholarly Brain

• 1993ASSL..182...21K
  – Advice from the Oracle: Really Intelligent Information Retrieval
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**Driving Marketing Effectiveness by Managing**

**The Flood of Big Data**

- **US$2.1 billion** spent on mobile ads in 2011
- **4.8 trillion** online ad impressions in 2011
- **US$83.2 billion** in mobile ad spend for 2012
- **294 billion** emails sent every day
- **100 terabytes** of data uploaded daily
- **230 million** tweets a day

**Big Data = Big Opportunity**
LHC: The Large Hadron Collider

CMS -- Le "Compact Muon Solenoid"
Cette image montre une collision simulée d'une collision du CMS. Le centre de l'image montre où les protons sont entrés en collision et l'énergie résultante d'annihilation produit des jets de nouvelles particules qui peuvent se déplacer dans le détecteur.

L'image est une de celles que nous espérons voir quand CMS sera en fonction: elle met en évidence le boson de Higgs, la particule qui confère une masse à toutes les autres particules et que le LHC devrait pouvoir détecter.
Conceive
Perceive
Words
THE LANGUAGE INSTINCT
HOW THE MIND CREATES LANGUAGE
STEVEN PINKER
AUTHOR OF THE STUFF OF THOUGHT
Super-organisms
...the highest level of the ant colony is the totality of its membership rather than a particular set of superordinate individuals who direct the activity of members at lower levels.

Hölldobler and Wilson (1990)
These are termites

WORKER
Actual size 1/4-inch

SOLDIER
Actual size 5/16-inch

QUEEN
Actual size 1/2-inch

High Society

Original Soundtrack

Bing Crosby  Grace Kelly  Frank Sinatra
Communication
The system of radiation which embraces the whole planet, and includes the million million brains of the race, becomes the physical basis of a racial self...

But chiefly the racial mind transcends the minds of groups and individuals in philosophical insight into the true nature of space and time, mind and its objects, cosmical striving and cosmical perfection.... For all the daily business of life, then, each of us is mentally a distinct individual, though his ordinary means of communication with others is “telepathic.” But frequently he wakes up to be a group-mind...

Of this obviously, I can tell you nothing, save that it differs from the lowlier state more radically than the infant mind differs from the mind of the individual adult, and that it consists of insight into many unsuspected and previously inconceivable features of the familiar world of men and things.
CPU Transistor Counts 1971-2008 & Moore's Law

Curve shows 'Moore's Law': transistor count doubling every two years
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Testing Weak-lensing Maps with Redshift Surveys: A Subaru Field
Kurtz, Michael J.; Geller, Margaret J.; Utsumi, Yousuke; Miyazaki, Satoshi; and 2 coauthors
Testing Weak-lensing Maps with Redshift Surveys: A Subaru Field

Kurtz, Michael J.; Geller, Margaret J.; Utsumi, Yousuke; Miyazaki, Satoshi; Dell'Antonio, Ian P.; Fabricant, Daniel G.

Published in May 2012
DOI: 10.1088/0004-637X/750/2/168

We use a dense redshift survey in the foreground of the Subaru GTO2deg2 weak-lensing field (centered at $a2000 = 18h04m44s; \delta2000 = 43^\circ11'24''$) to assess the completeness and comment on the purity of massive halo identification in the weak-lensing map. The redshift survey (published here) includes 4541 galaxies; 4405 are new redshifts measured with the Hectospec on the MMT. Among the weak-lensing peaks with a signal-to-noise greater than 4.25, 2/3 correspond to individual massive systems; this result is essentially identical to the Geller et al. test of the Deep Lens Survey (DLS) field F2. The Subaru map, based on images in substantially better seeing than the DLS, enables detection of less massive halos at fixed redshift as expected. We demonstrate that the procedure adopted by Miyazaki et al. for removing some contaminated peaks from the weak-lensing map improves agreement between the lensing map and the redshift survey in the identification of candidate massive systems.

Keywords:
- Astronomy: cosmology; observations, galaxies: clusters: general, galaxies: distances and redshifts, gravitational lensing: weak, large-scale structure of Universe

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3. 2011MNRAS.413.1145B Cited by 5 [EFSLDRCU] Optimal filtering of optical and weak lensing data to search for galaxy clusters: application to the COSMOS field Bellagamba, F.; Maturi, M.; Hamana, T.; Meneghetti, M.; and 2 coauthors

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8. 1999ApJS..122...51D Cited by 366 [EFXDRC] A Spectroscopic Catalog of 10 Distant Rich Clusters of Galaxies Dressler, Alan; Smail, Ian; Poggianti, Bianca M.; Butcher, Harvey; and 3 coauthors

9. 2005PASP..117.1411F Cited by 114 [EXRC] Hectospec, the MMT's 300 Optical Fiber-Fed Spectrograph
A Spectroscopic Catalog of 10 Distant Rich Clusters of Galaxies

Dressler, Alan; Smail, Ian; Poggianti, Bianca M.; Butcher, Harvey; Couch, Warrick J.; Ellis, Richard S.; Oemler, Augustus, Jr.

Published in May 1999
DOI: 10.1086/313213

We present spectroscopic observations of galaxies in the fields of 10 distant clusters for which we have previously presented deep imaging with WFCPC2 on board the Hubble Space Telescope. The clusters span the redshift range $z=0.37-0.56$ and are the subject of a detailed ground- and space-based study to investigate the evolution of galaxies as a function of environment and epoch. The data presented here include positions, photometry, redshifts, spectral line strengths, and classifications for 657 galaxies in the fields of the 10 clusters. The catalog is composed of 424 cluster members across the 10 clusters and 233 field galaxies, with detailed morphological information from our WFCPC2 images for 204 of the cluster galaxies and 71 in the field. We illustrate some basic properties of the catalog, including correlations between the morphological and spectral properties of our large sample of cluster galaxies. A direct comparison of the spectral properties of the high-redshift cluster and field populations suggests that the phenomenon of strong Balmer lines in otherwise passive galaxies (commonly called E+A but renamed here as the k-a class) shows an order-of-magnitude increase in the rich cluster environment compared with a more modest increase in the field population. This suggests that the process or processes involved in producing k+a galaxies are either substantially more effective in the cluster environment or that this environment prolongs the visibility of this phase. A more detailed analysis and modeling of these data is presented in Poggianti et al.

Keywords:
Astronomy: Galaxies: Clusters: General, Galaxies: Distances and Redshifts
A SPECTROSCOPIC CATALOG OF 10 DISTANT RICH CLUSTERS OF GALAXIES

ALAN DRESSLER,1,2,3 IAN SMALL,2,3,4 BIANCA M. POGGIANTI,5,6,7 HARRY BUTCHER,1
WARREN J. COUCH,8,9 RICHARD S. ELLEN,8,9 AND AUGUSTUS OMELER, JR.1

Received 1996 June 1; accepted 1996 December 31

ABSTRACT

We present spectroscopic observations of galaxies in the fields of 10 distant clusters for which we have previously presented deep imaging with WFPC2 onboard the Hubble Space Telescope. The clusters span the redshift range $z = 0.37$–0.56 and are subject of a detailed ground- and space-based study to investigate the evolution of galaxies as a function of environment and epoch. The data presented here include positions, photometry, redshifts, spectral line strengths, and classifications for 657 galaxies in the fields of the 10 clusters. The catalog is composed of 424 cluster members across the 10 clusters and 233 field galaxies, with detailed morphological information from our WFPC2 images for 204 of the cluster galaxies and 71 in the field. We illustrate some basic properties of the catalog, including correlations between the morphological and spectral properties of our large sample of cluster galaxies. A direct comparison of the spectral properties of the high-redshift galaxies shows that the phenomenon of strong Balmer lines in otherwise passive galaxies (commonly called E+A but renamed here as the $k + a$ class) shows an order-of-magnitude increase in the rich cluster environment compared with a more modest increase in the field population. This suggests that the process or processes involved in producing $k + a$ galaxies are either substantially more effective in the cluster environment or that this environment prolongs the visibility of this phase. A more detailed analysis and modeling of these data are presented in Poggianti et al.

Subject headings: galaxies: clusters: general — galaxies: distances and redshifts — galaxies: evolution — galaxies: photometry

I. INTRODUCTION

The change with redshift observed in the proportion of star-forming galaxies in the cores of rich clusters was uncovered over 20 years ago, by Butcher & Oemler (1978, 1984), but it remains one of the clearest and most striking examples of galaxy evolution. Considerable effort has gone into acquiring photometric information that would elucidate the physical processes active in distant clusters and their effects on the evolution of both the star-forming (Lavery & Henry 1994; Lubin 1996; Rakos & Schombert 1995; Rakos, Odell, & Schombert 1997) and passive galaxies (Aragon-Salamanca et al. 1993; Stanford, Eisenhardt, & Dickinson 1995, 1998; Small et al. 1998). Further impetus has been provided by observations of the recent transformation of the SO population of clusters (Dressler et al. 1997), which may allow a closer connection to be drawn between the galaxy populations of distant clusters and the evolutionary signatures found in their local universe counterparts (Caldwell & Rose 1997; Bothun & Gregg 1990).

However, it was the advent of spectroscopic surveys of the distant cluster populations (e.g., Dressler & Gunn 1983, 1992, hereafter DCG92; Couch & Sharples 1987, hereafter

1 The Observatories of the Carnegie Institution of Washington, 813 Santa Barbara Street, Pasadena, CA 91101-1292.
2 Department of Physics, University of Durham, South Rd, Durham DH1 3LE, UK.
3 Visiting Research Associate at the Carnegie Observatories.
4 Institute of Astronomy, Madingley Road, Cambridge CB3 0HA, UK.
5 Royal Greenwich Observatory, Madingley Road, Cambridge CB3 0EZ, UK.
6 Observatorio Astronomico di Padova, vicolo dell'Osservatorio 5, 35122 Padova, Italy.
7 NPEA, PO Box 2, NL-7900 AA Dwingeloo, The Netherlands.
8 School of Physics, University of New South Wales, Sydney 2052, Australia.

CS7; Barger et al. 1996; Abraham et al. 1996; Fisher et al. 1998) that uncovered the real breadth of the changes in galaxies in these environments, including several spectral signatures of evolutionary change, such as evidence for a strong decline in the star formation rates of many cluster galaxies in the recent past. The advent of high-spatial resolution imaging with the Hubble Space Telescope (HST) provided a further breakthrough, allowing morphological information on the galaxies in these distant clusters. This could be used to link the evolution of stellar populations in the galaxies with the evolution of their structure in order to understand how the various galaxy types we see in the local universe came to be. Pre- and post-refurbishment HST observations by two groups (Couch et al. 1994, 1998; Dressler et al. 1994; Oemler, Dressler, & Butcher 1997) were used in early attempts to correlate spectral evolution with morphological/structural data and to provide some insight into the mechanisms that might be driving the strong evolution in the cluster galaxy population. These two programs were extended from cycle 4 into the "MORPHS" project, which accumulated post-refurbishment WFPC2 images for 11 fields in 10 clusters at $z = 0.37$–0.56, viewed at a time some 2–4 $h^{-1}$ billion yr before the present day. The photometric and morphological galaxy catalogs from these images were presented in Small et al. (1997a, hereafter S97), while the data have also been used to study the evolution of the early-type galaxies within the clusters, using both color (Ellis et al. 1997) and structural information (Barger et al. 1998), the evolution of the morphology-density relation of $k + a$.
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Marrone, Daniel P.; Smith, Graham P.; Okabe, Nobuhiro; Bonamente, Massimiliano; and 21 coauthors
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CLASH: Precise New Constraints on the Mass Profile of the Galaxy Cluster A2261

Coe, Dan; Umetsu, Keiichi; Zitrin, Adi; Donahue, Megan; Medezinski, Elinor;
Postman, Marc; Carrasco, Mauricio; Anguita, Timo; Geller, Margaret J.;
Rines, Kenneth J.; and 36 coauthors

show affiliations

Published in Sep 2012
DOI: 10.1088/0004-637X/757/1/22

We precisely constrain the inner mass profile of A2261 (z = 0.225) for the first time and determine that this cluster is not "overconcentrated" as found previously, implying a formation time in agreement with ΛCDM expectations. These results are based on multiple strong-lensing analyses of new 16-band Hubble Space Telescope imaging obtained as part of the Cluster Lensing and Supernova survey with Hubble. Combining this with revised weak-lensing analyses of Subaru wide-field imaging with five-band Subaru + KPNO photometry, we place tight new constraints on the halo virial mass $M_{\text{vir}} = (2.2 \pm 0.2) \times 10^{15} M_\odot$; $h^{-1} 70$ (within $r_{\text{vir}} \approx 3 \ Mpc$ $h^{-1} 70$) and concentration $c_{\text{vir}} = 6.2 \pm 0.3$ when assuming a spherical halo. This agrees broadly with average $c(M, z)$ predictions from recent ΛCDM simulations, which span 5 $\sim$ langcang $\sim$ 8. Our most significant systematic uncertainty is halo elongation along the line of sight (LOS). To estimate this, we also derive a mass profile based on archival Chandra X-ray observations and find it to be $\sim$35% lower than our lensing-derived profile at $r = 2500 \sim 600 \ kpc$. Agreement can be achieved by a halo elongated with a $\sim 2:1$ axis ratio along our LOS. For this elongated halo model, we find $M_{\text{vir}} = (1.7 \pm 0.2) \times 10^{15} M_\odot$; $h^{-1} 70$ and $c_{\text{vir}} = 4.6 \pm 0.2$, placing rough lower limits on these values. The need for halo elongation can be partially obviated by non-thermal pressure support and, perhaps entirely, by systematic errors in the X-ray mass measurements. We estimate the effect of background structures based on MMT/Hectospec spectroscopic redshifts and find that these tend to lower $M_{\text{vir}}$ further by $\sim 7\%$ and...
We are creating the Lizard Brain of the new organism
Conceive

Perceive
The system of radiation which embraces the whole planet, and includes the million million brains of the race, becomes the physical basis of a racial self... But chiefly the racial mind transcends the minds of groups and individuals in philosophical insight into the true nature of space and time, mind and its objects, cosmical striving and cosmical perfection.... For all the daily business of life, then, each of us is mentally a distinct individual, though his ordinary means of communication with others is “telepathic.” But frequently he wakes up to be a group-mind.... Of this obviously, I can tell you nothing, save that it differs from the lowlier state more radically than the infant mind differs from the mind of the individual adult, and that it consists of insight into many unsuspected and previously inconceivable features of the familiar world of men and things.