3 December 1998

Astronomy 291
Topics in Modern Cosmology
Tentative Meeting Schedule and Reading List
Mondays 2:00 to 5:00 P.M.
Pratt Conference Room

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Course Description: This is an advanced graduate seminar on topics in modern cosmology and extragalactic astronomy. The seminar will meet 2-3 hours per week and discuss assigned papers and other material on such topics as large-scale structure, the Cosmic distance scale, the Cosmic microwave background, galaxy formation, large-scale flows, galaxy luminosity functions, the geometry of space, and dark matter.

Sept 28 — World Models, Sandage, A. 1988, ARA&A 26, 561; and Sandage, A. 1961, ApJ 133, 355. (note 2nd article listed is the "old" version of the first).

Oct 5 — Luminosity Functions, $\phi(L)$, Schechter, P. 1976, ApJ 297, 306; Efstathiou, G., Ellis, R. & Peterson, B. 1988, MNRAS 232, 431; Marzke *et al.* 1994, AJ 108, 437; Binggeli, B., Sandage, A. & Tammann, G. 1988, ARA&A 26, 509; Impey, C. & Bothun, G. 1997, ARA&A 35, 267.

Oct 19 — Galaxy Evolution, Tinsley, B. 1968, ApJ 151, 547; Searle, L., Sargent, W. L. W. & Bagnuolo, W. 1973, ApJ 179, 427; Huchra, J. 1977, ApJ 217, 928; Bruzual, G. 1983, ApJ 273, 105; Bruzual, G. & Charlot, S. 1993, ApJ 405, 538; Worthey, G. 1994, ApJS 95, 107; Fioc, M. & Rocca-Volmerange, B. 1997, A&A 326, 950; Trager, S. *et al.* 1998, ApJS 116, 1.

Oct 26 — Cosmic Distance Scale Trimble, V. 1996, PASP 108, 1073; Sandage and Tammann papers I-IX, 1974-1990; de Vaucouleurs *et al.* papers I-VII, 1978-1980; Aaronson etal papers O-III+V, 1979-1986. (see also Rowan-Robinson, M. 1986, *The Cosmological Distance Scale.*

Nov 2 — Cosmic Distance Scale, Λ Jacoby, G. *et al.* 1992, PASP 104, 599; Vandenbergh 1992, PASP 104, 861; Huchra, J. 1992, Science 256, 321; Kennicutt, R., Freedman, W. & Mould, J. 1995, AJ 110, 1476; Tammann, G. Astroph9805013; Madore, B. etal 1998, Nature 395, 47; Cen ApJL 498, L99; Romanowsky & Kochanek 1998, Astroph9805080; Branch 1998, Ann Rev in press, Astroph9801065;

Nov 9 — Large Scale Structure Davis, M. & Peebles, P. J. E. 1983, ARAA 21, 109; Geller, M. 1987, in 17th Saas-Fee Lectures, Martinet and Mayor, eds.; Bahcall, N. 1988, ARAA 26, 631; Giovanelli, R. & Haynes, M. 1991, ARAA 29, 499.

Nov 16 — Large Scale Structure Davis, Efstathiou, Frenk and White 1985, ApJ 292, 371; Vogeley Astroph980516; Gawiser & Silk 1980, Science 280, 1405.

Nov 30 — Large Scale Motions Aaronson, M. *et al.* 1982, ApJ 258, 64; Lynden-Bell, D. *et al.* 1988, ApJ 326, 19; Schechter 1980, AJ 85, 801.

Dec 7 — Galaxy Formation Blumenthal, Faber, Primack & Rees, 1984, Nature 311, 517; Baugh, C., Cole, S., Frenk, C. & Lacey, C. 1998, ApJ 498, 504; Dalcanton, J, Spergel, D. and Summers, F. 1997, ApJ 482, 659; Sandage, A. 1990, JRASC 84, 70.

Dec 14 — Galaxy Counts, Ellis, R. 1997, ARA&A

Dec 21? — Dark Matter, Ω Faber, S. & Gallagher, J. ARA&A 1977; Bertschinger & Dekel 1989, ApJ 336, L5.

Students interested in taking or auditing this course should contact the instructor in advance.

Reading Lists by Subject

The Galaxy Luminosity Function

* Hubble, E. 1936, Ap J. **84**, 158; **84**, 270. Gaussian

Holmberg, E. 1950, Medd. Lund Series 2 #128. Mod-Gaussian

* Zwicky, 1957, *Morphological Astronomy*, circa p. 220. Power Law

Kiang, T. 1961, MNRAS **122** 263.

Abell, G. 1962, IAU Coll. #15, 213. Twin Power Laws

Schmidt, M. 1969, Ap. J. **162**, 371. V/Vm technique

Lynden-Bell, D. 1971, MNRAS **155**, 95. C-method

Huchra, J. and Sargent, W.L.W. 1983, Ap. J. **186**, 433. V/Vm

Press, W. and Schechter, P. 1974, ApJ 187, 425. Self-similar Galaxy Formation

Schechter, P. 1976, Ap. J. **203**, 297. Definition of SF

Felten, J. 1977, Ap. J. **207**, 700.

* Felten, J. 1977, A.J. **82**, 861. Absorption, Bins vs V/Vm

* Turner, E. 1979, **230**, 291; **231** 645. Nonparametrics

Tammann, G., Yahil, A. and Sandage, A. 1979, Ap. J. **234**, 775. RSA and types

Davis, M. and Huchra, J. 1982, Ap. J. **254**, 437. CfA1

Kirshner, R. Oemler, A., Schechter, P. and Shectman, S. 1983, A.J. **88**, 1285. KOSS Survey

Bean, A. *et al.* 1983, MNRAS **205**, 135. AAT Survey

Segal, I. and Nicholl, J. — series on Robust Estimation.

Felten, J. 1985, Comm. on Astr. **11**, 53. Review

Sandage, A., Binggeli, B. and Tammann, G. 1985, A.J. 90 1759. Virgo, Types

Choloniewski, J. 1986, MNRAS **223**, 1. Likelihood

* Eftstathiou, G., Ellis, R. and Peterson, B. 1988, MNRAS **232**, 431. Stepwise Maximum Likelihood, Review

Binggeli, B., Sandage, A. & Tammann, G. 1988, ARA&A 26, 509 (Major Review)

* DeLapparent, V. Geller, M. and Huchra, J. 1989, Ap. J. **343**, 1. CfA2

Loveday, *et al.* 1992, Ap. J. **390**, 338. Stromolo-AAT Survey

Huchra, J. and Burg, R. 1992, Ap. J. **393**, 90. Seyferts, Correlation Function

Eales, S. 1993, ApJ, 404,51

Marzke, R., Huchra, J. & Geller, M. 1994, ApJ 428, 43

Marzke *et al.* 1994, AJ 108, 437 (CfA Survey)

Lin, H. *et al.* 1996, ApJ 464, 60

Marzke, R. & DaCosta, L. 1997, AJ 113, 185

Gardner, J. *et al.* 1997, ApJL 480, L99 (K-band LF)

Impey, C. & Bothun, G. 1997, ARA&A 35, 267.

Sprayberry, D. *et al.* ApJ 482, 104 LSB Galaxies

Willmer, C. 1997, AJ 114, 898 (Methods)

Zucca, E. *et al.* 1997, A&A 326, 477 (ESO Slice Project)

Bromley, B. *et al.* 1998, ApJ595, 25

Dalcanton, J. 1998, ApJ 495, 251 (Biases in LF)

Trentham, N. 1998, MNRAS 294, 193 (Clusters and the Field)

Marzke, R. *et al.* 1998, ApJ 503, 617. (SSRS2)

The Extragalactic Distance Scale

Rowan-Robinson, M. *The Cosmological Distance Ladder*, Freeman and Co. 1985.

Huchra, J. 1992, Science *April 17*.

Jacoby, G. *et al.* 1992, *PASP* **104** 861.

van den Bergh, S. 1992, *PASP* **104** 599.

The Extragalactic Distance Scale, 1992, PASP Vol 4, van den Bergh and Pritchet,eds.

Galaxy Distances and Deviations from Universal Expansion, 1986, Madore and Tully, eds.

The Extragalactic Distance Scale, HST Symposium, 1997, M. Livio, *et al.* , eds. (Cambridge: Cambridge).

Important Series:

Sandage and Tammann, *Steps Towards the Hubble Constant* —

I. *Ap. J.* **190**,525, 1974. HII Regions
II. *ibid* **191**, 603, 1974. Brightest Stars
III. *ibid* **194**, 223, 1974. M101 Group
IV. *ibid* **194**, 559, 1974. 39 Sc Galaxies
V. *ibid* **196**, 313, 1975. Local Field
VI. *ibid* **197**, 265, 1975. Remote Sc's and q_0
VII. *ibid* **210** 7, 1976. HI-TF
VIII. *ibid* **256**, 339, 1982. Global Value
IX. *ibid* **365** , 1, 1990. H_0 without pain ....

Sandage, A. Ap. J. **331**, 583, 1988. Luminous Spirals, H=42

Sandage, A. Ap. J. **331**, 605, 1988. Optical TF, H=55

Sandage, A. Ap. J. **402**, 3, 1993. Spiral Diameters, H=43

Sandage, Saha, *et al.* Ap. J. Lett. **401**, L7, 1992. IC4182 Cepheids

Sandage, A. Tammann, G. and Federspeil, 1995, ApJ 452, 1.

Sandage, A. *et al.* 1996, ApJ,460, L15.

Saha, A. *et al.* 1996, ApJ 466, 55.

de Vaucouleurs, *The Extragalactic Distance Scale* —

I. Ap. J. **223**. 351, 1978. Review, Z0's, σ's
II. Ap. J. **223**, 730, 1978. Primary Distances
III. Ap. J. **224**, 14, 1978. Secondary Distances
IV. Ap. J. **224**, 710, 1978. Groups and Field Galaxies
V. Ap. J. **227**, 380, 1979. Tertiary Distances
VI. Ap. J. **227**, 729, 1979. 458 Sprials
VII. Ap. J. **233**, 433, 1979. Directions and Local Supercluster

Bollinger *et al.* Ap. J. **242,** L153, 1980. TF

DV+ Peters Ap. J. **248**, 395, 1981. Luminosity Index

DV *et al.* Ap. J. **248**, 408, 1981. TF

Aaronson, Mould, Huchra *et al.* — A Distance Scale From the IRTF Relation
O. Ap. J. **229**, 1, 1979.
I. Ap. J. **237**, 655, 1980. Calibration
II. Ap. J. **238**, 458, 1980. Virgo
III. Ap. J. **239**, 12, 1980. 6 Clusters
Ap. J. **265**, 1, 1983.
Ap. J. **278**, 475, 1984. Sc I's
V. Ap. J. **302**, 536, 1986. 10 Clusters
Ap. J. **303**, 1, 1986.

Other Papers —

Pierce and Tully series ——-

e.g. Pierce and McClure, Ap. J. **393**, 523, 1992. N4571 Brightest Stars

Tully and Fisher A. and Ap. **54**, 661, 1977. Guess!

Tonry and Schneider, A. J. **96**, 807, 1988. Fluctuations.

Kirshner and Kwan, Ap. J. **193**, 27, 1974. Sn II expansion.

Schmidt, Kirshner and Eastman, Ap. J. , 1992. Sn II.

Leibengut and Pinto, Ap. J. **401**, 49, 1992. Sn Ia calibration.

Fukugita and Hogan, Ap. J. Lett. **368**, L11, 1991. Sn Ia calibration.

Freedman, Ap. J. Lett. **355**, L35, 1990. Cepheid Calibration.

Madore and Freedman, PASP **103**, 933, 1991. Cepheids.

Falco, Gorenstein and Shapiro, Ap. J. **372**, 364, 1991. 0957 Lens.

Birkinshaw, Hughes and Arnaud, Ap. J. **379**, 466, 1991. SZ-effect.

Branch, D. and Miller, D. 1993, Ap. J. 405, L5.

Malmquist Biases —
Malmquist, Medd. Lund. Series 2, No 22, 1920.

Teerikorpi, A. and Ap. **45**, 117, 1975. Selection effects

Bottinelli *et al.* A. and Ap. **156**, 167, 1986.

Giraud, Ap. J. **301**, 7, 1986.

Bottinelli *et al.* Ap. J. **328**, 4, 1988. MB controversies and misconceptions.

Tanvir, N. *et al.* 1995, Nature 377, 27

Key Project Papers

1994 The Hubble Space telescope Extragalactic Distance Scale Key Project. I. The Discovery of Cepheids and a New Distance to M81, W. Freedman, S. Hughes, B. Madore, J. Mould, M. G. Lee, P. Stetson, R. Kennicutt, A. Turner, L. Ferrarese, H. Ford, J. Graham, R. Hill, J. Hoessel, J. Huchra, and G. Illingworth, ApJ,427,628.

1994 Distance to the Virgo Cluster Galaxy M100 from Hubble Space Telescope Observations of Cepheids, W. Freedman, B. Madore, J. Mould, R. Hill, L. Ferrarese, R. Kennicutt, A. Saha, P. Stetson, J. Graham, H. Ford, J. Hoessel, J. Huchra, S. Hughes and G. Illingworth, Nature, 371,757.

1995 Limits on the Hubble Constant from the Distance of M100, J. Mould, J. Huchra, F. Bresolin, L. Ferrarese, H. Ford, W. Freedman, M. Han, P. Harding, R. Hill, J. Hoessel, S. Hughes, G. Illingworth, D. Kelson, R. Kennicutt, B. Madore, R. Phelps, A. Saha, N. Silbermann, P. Stetson and A. Turner, ApJ, 449, 413.

1996 The Extragalactic Distance Scale Key Project III. The Discovery of Cepheids and a New Distance to M101 Using the Hubble Space Telescope, D. Kelson, G. Illingworth, W. Freedman, J. Graham, R. Hill, B. Madore, A. Saha, P. Stetson, R. Kennicutt, J. Mould, S. Hughes, L. Ferrarese, R/ Phelps, A. Turner, K. Cook, H. Ford, J. Hoessel and J. Huchra, ApJ 463, 26.

1996 The HST Key Project on the Extragalactic Distance Scale VI. The Cepheids in NGC925, N. Silberman, P. Harding, B. Madore, R. Kennicutt, A. Saha, P. Stetson, W. Freedman, J. Mould, J. Graham. R. Hill, A. Turner, F. Bresolin, L. Ferrarese, H. Ford, J. Hoessel, M. Han, J. Huchra, S. Hughes, G. Illingworth, R. Phelps, and S. Sakai, ApJ, 470,1.

1996 The HST Key Project on the Extragalactic Distance Scale VIII. The Discovery of Cepheids and a New Distance to NGC3621 Using the Hubble Space Telescope, D. Rawson, J. Mould, L. Macri, J. Huchra, R. Kennicutt, W. freedman, R. Hill, R. Phelps, S. Hughes, B. Madore, N. Silberman, S. Sakai, L. Ferrarese, H. Ford, G. Illingworth, D. Kelson, J. Graham, J. Hoessel, M. Han, A. Turner, P. Harding, F. Bresolin, A. Saha and P. Stetson, ApJ, in press.

1997 The Extragalactic Distance Scale Key Project V. Photometry of the Brightest Stars in M100 and the Calibration of the WFPC2, R. Hill, L. Ferrarese, P. Stetson, A. Saha, W. Freedman, H. Ford, J. Graham, J. Hoessel, M. Han, J. Huchra, S. Hughes, G. Illingworth, D. Kelson, R. Kennicutt, F. Bresolin, P. Harding, A. Turner, B. Madore, S. Sakai, N. Silbermann, J. Mould and R. Phelps, Ap. J. in press.

Note: for more information and history see the main website http://cfa-www.harvard.edu/~huchra.

Galaxy Counts and Galaxy Evolution

Reviews and Symposia:

Koo, D. and Kron, R. 1992, Ann. rev. A. and Ap. 30, 613.

Norman, C., Renzini, A. and Tosi, M. eds. 1986, *Stellar Populations* StScI Conference Series Vol 1, (Cambridge: Cambridge).

Bergeron, J. *et al.* eds. 1987, *High Redshift and Primeval Galaxies*, (Gif Sur Yvette: Editions Frontieres).

Kron, R. and Renzini, A. 1988, eds. *Towards Understanding Galaxies at High Redshift*, Dordrecht: Kluwer).

Kron, R. ed. 1990, *Evolution of the Universe of Galaxies* Edwin Hubble Centennial, ASP Conference Series Vol 10.

Shanks, T. ed. 1991, *Observational Tests of Cosmic Inflation* (Dordrecht: Kluwer).

Galaxy Evolution:

Baade, W. & Spitzer, L. 1951, ApJ 113, 413.

Tinsley, B. M. 1968, ApJ 151, 547.

Tinsley, B. M. 1972, ApJ 178, 319.

Searle, L., Sargent, W.L. W. & Bagnuolo, W. 1973, ApJ 179, 427.

Ostriker, J. and Tremaine, S. 1975, ApJ 202, L113.

Richstone, D. 1975, ApJ 200, 535.

Ostriker, J. and Hausman, M. 1977, ApJL 217, L125.

Huchra, J. 1977, ApJ 217, 928.

Huchra, J. 1977, ApJS 35, 171.

Larson, R. & Tinsley, B. 1978, ApJ 219, 46.

Bruzual, G. 1983, ApJ 273, 105.

Bruzual, G. 1983, ApJS 53, 497.

Guiderdoni, B. & Rocca-Volmerange, B. 1987, A&A 186, 1.

Brocato, E. *et al.* 1990, ApJ 349, 458.

Charlot, S. and Bruzual, G. 1991, ApJ 367, 126.

Newbury *et al.* 1990, ApJ 350, 585.

Guiderdoni, B. and Rocca-Volmerange, B. 1991, A&A 252, 435

Bruzual, G & Charlot, S. 1993, ApJ 405, 538

Bressan, A., Chiosi, C. & Fagotto, F. 1994, ApJS 94, 63

Worthey, G. 1994, ApJS 95, 107

Fioc, M. & Rocca-Volmerange, B. 1997, A&A 326, 950

Trager, S. *et al.* 1998, ApJS 116, 1.

Galaxy Ages

Chambers and Charlot, 1990, ApJL 348, L1.

Lilly, S. 1988, ApJ 333, 161.

Galaxy Counts, Colors and Clusters:

Brown, G. and Tinsley, B. 1974, Ap. J. 194, 555.

Butcher, H. and Oemler, A. 1978, Ap.J. 219, 18; 226, 559.

Tinsley, B. 1977, Ap. J. 211, 621; 216, 349.

Tinsley, B. 1978, Ap. J. 220, 816; 1980, 241, 41.

Tyson, J. A. and Jarvis, J. 1979, Ap. J. 230, L153.

Bruzual, G. and Kron, R. 1980, Ap. J. 241, 25.

Koo, D. 1985, A.J. 90, 418. colors vs z

Tyson, J. A. and Seitzer, P. 1988, Ap. J. 335, 552. 12 deep fields

Broadhurst, T., Ellis, R., and Shanks, T. 1988, MNRAS 235, 827.

Cowie, L. *et al.* 1988, Ap. J. Let. 332, L29. K gals

Colless, *et al.* 1990, MNRAS 244, 408.

Cowie, L. *et al.* 1990, Ap. J. Lett. 360, L1. K band survey

Tyson, J. A. *et al.* 1990, Ap. J. Lett. 349, L1. Lensing of blue gals

Yoshii and Peterson, B. 1991, Ap. J. 372, 8.

Efstathiou, G. *et al.* 1991, Ap. J. 380, L47. clustering

Jones, L. *et al.* 1991, MNRAS 249, 481. plates to 23.5

Metcalfe, N. *et al.* 1991, MNRAS 249, 498. CCD counts to 25

Guiderdoni, B. and Rocca-Volmerange, B. 1991, A. and Ap. 252, 435.

Lilly, S. Cowie, L. and Gardner, J. 1991, Ap. J. 369, 79.

Broadhurst, T., Ellis, R. and Glazebrook, K. 1992, Nature 355, 55.

Dressler, A. and Gunn, J. 1982, Ap. J. Suppl. 75, 1. clusters

Dressler, A., Oemler, A., Gunn, J. and Butcher, H. 1993, Ap. J.L. 404, L45. z=2 cluster?

Colless, M. *et al.* 1993, MNRAS 261, 19.

Sidetracks:

Loh, E. and Spillar, A. 1986, Ap. J. 303, 154; 307, L1. photometric redshifts and Ω

Loh, E. 1988, Ap. J. 329, 24. volume test

Bahcall, S. and Tremaine, S. 1988, Ap. J. 326, L1. apologia

Galaxy Formation:

Baugh, C., Cole, S., Frenk, C. & Lacey, C. 1998, ApJ 498, 504.

Dalcanton, J, Spergel, D. and Summers, F. 1997, ApJ 482, 659.

Eggen, O. J., Lynden-Bell, D. & Sandage, A. 1962, ApJ 136, 748.

Field, G. 1975, in *Galaxies and the Universe*, Sandage, *et al.* eds. (Chicago: Chicago), p. 359.1

Blumenthal, G., Faber, S., Primack, J. and Rees, M. 1984, Nature 311, 517.

Lacey, C. & Cole, S. 1993, MNRAS 262, 627. Merger Rates

Lacey, C. & Cole, S. 1994, MNRAS 271, 676. Merger Rates II

lacey, C. & Silk, J. 1991, ApJ 381, 14. Tidally Triggered GF

Sandage, A. 1990, J. RASC 84, 70.

VandenBergh, S. 1996, PASP 108, 986.

Large Scale Structure/Large Scale Flows

Reviews and Symposia:

Davis,M. and Peebles, P. J. E. 1983, Ann. Rev. A. and Ap. 21, 109. Local Anisotropy

Oort, J. 1983, Ann. Rev. A. and Ap. 21, 373. Superclusters

Geller, M. 1987, in 17th Saas-Fee Lectures, Martinet and Mayor, eds.

Bahcall, N. 1988, Ann. Rev. A. and Ap. **26,** 631. Clusters

Geller, M. and Huchra, J. 1989, Science, **246**, 897. Redshift Surveys

Giovanelli, R. and Haynes, M. 1991, Ann. Rev. A. and Ap. **29**, 499. Redshift Surveys

Burstein, D. 1990, Rep. Prog. Phys. 53, 421. Flows

Ostriker, J. 1993, Ann. rev. A. and Ap. "Tests of the CDM Scenario"

Peebles, P. J. E. 1980, *The Large Scale Structure of the Universe*, (Princeton: Princeton).

Madore, B. and Tully, R. B. eds. 1986, *Galaxy Distances and Deviations from Universal Expansion*, (Dordrecht: Reidel).

Dickey, J. ed. 1988, *Minnesota Lectures on Clusters of Galaxies and Large Scale Structure*, (Provo: ASP).

Rubin, V. and Coyne, G. eds. 1988, *Large Scale Motions in the Universe*, (Princeton: Princeton).

Latham, D. and da Costa, N. eds. 1991, *Large Scale Structures and Peculiar Motions in the Universe*, (Provo: ASP).

and millions of others ...... sigh!

Historical and Current References:

Rubin, V. 1951, MSc Thesis, Cornell.

Hauser, M. and Peebles, P. J. E. 1973, A. J. 185, 757.

Peebles, P. J. E. and Hauser, M.1974, Ap. J. Suppl. 28, 19; 28, 37. (and the related series running through 1980 with Seldner, Fry, Groth and others)

Turner, E. and Gott, J. R. III 1975, Ap. J. 197, L89. Single Galaxies

Gott, J. R. III and Turner, E. 1976, Ap. J. 209, 1.

Tifft, W. and Gregory, S. 1976, Ap. J. 205, 696. LSS Observed

Huchra, J. and T. X. Thuan, 1977, *Ap. J.* **216**, 694. Isolated Galaxies

Davis, M., Geller, M. and J. Huchra, 1978 *Ap. J.* **221**, 1. CVT

Aaronson, M., J. Mould, J. Huchra, W. Sullivan, R. Schommer and G. Bothun, 1980, *Ap. J.* **239**, 12. LS Flow

Yahil, A., Sandage, A. and Tammann, G. 1980, Ap. J. 242, 448. Local Density Field from RSA

Kirshner, R., Oemler, A., Schechter, P. and Shectman, S. 1981, Ap. J. 248, L57. Boötes Void.

Davis, M., J. Huchra, D. Latham and J. Tonry, 1982, *Ap. J.*, **253**, 423. Maps

Davis, M. and Huchra, J. 1982,*Ap. J.*, **254**, 437.

Aaronson, M., Huchra, J., Mould, J., P. Schechter, and R. B. Tully, 1982, *Ap. J.* **258**, 64. Virgo Infall

Huchra, J., Davis, M., Latham, D. and Tonry, J. 1983, Ap. J. Suppl. 52, 89. CfA1 survey

Bahcall, N. and Soniera, R. 1983, Ap. J. 270, 20. Abell Cluster $\xi(r)$

de Lapparent, V., M. Geller and J. Huchra, 1986, *Ap. J. Lett.* **302**, L1. 1st Slice

Dressler, A. *et al.* 1987, Ap. J. Lett. 313, L37. GA

Lynden-Bell, D. *et al.* 1988, Ap. J. 326, 19. GA "New Supergalactic Center"

daCosta, L. *et al.* 1988, Ap. J. 327, 544. SSRS

de Lapparent, V., M. Geller and J. Huchra, 1988, *Ap. J.* **332**, 44. Density and LF

J. Huchra, J. P. Henry, M. Postman and M. Geller, 1990, *Ap. J.***365**, 66. Deep Cluster Survey

Dressler, A. and Faber, S. 1990, Ap. J. 354, 17. GA Backside

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Maddox, S. *et al.* 1990, MNRAS 242, 43p. APM Survey $\omega(\theta)$.

Rowan-Robinson, *et al.* 1990, MNRAS 247, 1. IRAS Dipole

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Dekel, A., Bertschinger, E. and Faber, S. 1990, Ap. J. **364**, 349. POTENT

Bertschinger, E., Dekel, A., Faber, S., Dressler, A. and Burstein, D. 1990, Ap. J. **364**, 370. POTENT applied.

Burstein, D., Faber, S. and Dressler, A. 1990, Ap. J. 354, 18. GA revisited

Dressler, A. 1991, Ap. J. Supp. 75, 241. Supergalactic Plane Survey

daCosta, L. *et al.* 1991, Ap. J. Supp. 75, 935. SSRS

Mould, J. *et al.* 1991, Ap. J. **383**, 467.

Saunders, W. *et al.* 1991, Nature 349, 32; Kaiser, N. *et al.* MNRAS 252, 1. QDOT and Dipole

M. Strauss, M. Davis, A. Yahil and J. Huchra, 1992, *Ap. J.* **385**, 421. IRAS Density Field

Postman, M., Huchra, J. and M. Geller, 1992, *Ap. J.* **384** 404. Nearby Abell Clusters

Loveday, J. *et al.* 1992, Ap. J 390, 338. APM LF

Vogeley, M., Park, C., Geller, M. and Huchra, J. 1992, *Ap. J. Letters* **391**, L5. Power Spectrum

Strauss, M., Yahil, A., Davis, M., J. Huchra, and K. Fisher 1992, *Ap. J.* **397**, 395. LG Accelleration

Saunders, W., Rowan-Robinson, M. and Lawrence, A. 1992, MNRAS 258, 134. IRAS $\xi(r)$

Bothun, G. *et al.* 1992, Ap. J. 388, 253.

Efstathiou, G. *et al.* 1992, MNRAS 257, 12. APM and Abell Clusters

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