

# Neta A. Bahcall

**Eugene Higgins Professor of Astrophysics  
Director, Undergraduate Program in Astrophysics  
Princeton University**

Department of Astrophysical Sciences  
137 Peyton Hall, Princeton University  
Princeton, NJ 08544  
Tel: (609) 258-6065 Fax: (609) 258-1020  
E-mail: [neta@astro.princeton.edu](mailto:neta@astro.princeton.edu)  
<https://web.astro.princeton.edu/people/neta-bahcall>  
<http://web.astro.princeton.edu/bahcall-cv>



Neta A. Bahcall is the Eugene Higgins Professor of Astrophysics at Princeton University. She is Director of the Undergraduate Program in Astrophysics, recipient of the 2024 Henry Norris Russell award of the American Astronomical Society, the 2021 President's Distinguished Teaching Award of Princeton University, past Director of the Council on Science and Technology of Princeton University, and is an elected member of the US National Academy of Sciences, the American Academy of Arts and Sciences, a Legacy Fellow of the American Astronomical Society, Past Chair of the Astronomy Section of the National Academy of Sciences, Editorial Board member of the PNAS, and past Vice-President of the AAS. Bahcall research interests are focused on:

- Observational Cosmology
- Dark Matter, Dark Energy, and the Mass Density of the Universe
- Large-Scale Structure of the Universe; Clusters of Galaxies

- Tracing the Cosmic Distribution of Dark Matter, Baryons, and Light
- Formation and Evolution of Structure
- Quasars and Their Environment; Supermassive Black-Holes

Bahcall's work focuses on addressing questions such as: What is the large-scale structure of our Universe? How did structure form and evolve? How much dark matter exists in the Universe and where is it located? What is the nature of the mysterious dark energy? What is the fate of our Universe and its expansion? Bahcall uses different methods and a variety of tracers to answer these questions, including galaxies, clusters of galaxies, superclusters, and quasars. She combines observational data from large-scale surveys (such as the Sloan Digital Sky Survey and others) and other observations to determine the large-scale structure of the universe and its properties and compare it with those expected from cosmological simulations. Bahcall and Soneira determination of the cluster correlation function (1983) revealed the unexpected existence of very large scale structure in the Universe, up to  $\sim 150$  Mpc in scale, as well as a strongly increased clustering of clusters – confronting model expectations at that time. These results changed our understanding of the then standard cosmological models (the ‘Standard Cold Dark Matter’ – SCDM), as well as lead to the ‘biased galaxy formation’ model of structure formation. Bahcall and collaborators’ determination of properties such as the cluster mass function and its evolution with redshift, the mass-to-light function from galaxies to superclusters and from small to large cosmic scales, the geometrical shape of clusters and of large-scale structure, have all provided powerful constraints on cosmology including one of the first determinations of the mass-density of the Universe and the amplitude of mass fluctuations. The results revealed a sub-critical, light-weight Universe, with only  $\sim 25\%$  of the mass needed to halt the cosmic expansion; this contradicted the then Standard Cold Dark Matter model of a critical mass-density Universe ( $\sim 1980$ 's- $1990$ 's). This result has now been nicely confirmed by recent observations and is part of the current standard LCDM cosmology. Bahcall’s work helped pioneer the use of clusters of galaxies as a powerful tool in constraining cosmology -- a standard tool and methods currently commonly being used in cosmological investigations. Bahcall’s work has further explored “Where is the Dark Matter?” -- showing that most of the dark matter in the Universe is located in the large halos around galaxies and, unlike previous expectations, larger systems such groups and clusters are not more dark-matter dominated compared with galaxies: the total mass-to-light ratio of large systems is accounted for by the sum of the individual galaxies mass and light.

Bahcall works closely with students and postdoctoral fellows; their work is summarized in over 300 scientific publications. Bahcall is an elected member of the US National Academy of Sciences, the American Academy of Arts and Sciences, a Legacy Fellow of the American Astronomical Society, past Distinguished Research Chair at the Perimeter Institute for Theoretical Physics, Editorial Board Member of the Publications of the National Academy of Sciences (PNAS), past Chair of the Astronomy Section of the National Academy of Sciences, past Director of the Council on Science and Technology of Princeton University, and past

Vice-President and Councilor of the American Astronomical Society. Bahcall has been awarded the 2024 Henry Norris Russell Lectureship of the American Astronomical Society honoring ‘a lifetime of eminence in astronomical research’ -- *“For her central contributions to determining the average density of matter in the universe and establishing the concordance model of cosmology, and for her dedication to astronomical education and her exemplary service to the community”*, the 2021 President’s Distinguished Teaching Award of Princeton University, the de Vaucouleurs Medal, the Payne-Gasposkin Award, the Bennet-McWilliams Award, the Inaugural Alexander Lecturer Award, an Honorary Doctor of Science Degree - OSU, a Century Lecturer of the AAS, and has served as a member of various NASA, NSF, NAS, and Congressional Science committees.

Bahcall was born in Israel. She received her PhD from Tel Aviv University, working in Nuclear Astrophysics under the direction of Prof. William A. Fowler of Caltech. After receiving her PhD Bahcall moved to Princeton University in 1971. She has served as the first Head of the Science Program Selection Office and Chief of the General Observer Branch at the Hubble Space Telescope Science Institute in Baltimore, where she helped develop the science policies for HST, including its Key Projects, science selection process, and General Observer funding; these policies, procedures, and GO funding are now adopted widely by all space missions (and some ground-based observatories). Neta Bahcall married John N. Bahcall in 1966; they have three children: Safi, Dan, and Orli – all scientists.

## **Neta A. Bahcall**

### **Research Interests**

- Observational Cosmology
- Dark Matter, Dark Energy, and the Mass-Density of the Universe
- Large-Scale Structure of the Universe
- Clusters of Galaxies
- Tracing the Cosmic distribution of Dark Matter, Baryons, and Light
- Formation and Evolution of Structure
- Quasars and Their Environment
- Supermassive Black-Holes and their Galaxy Connection

## Education

- Ph.D. Astrophysics: Tel Aviv University, Israel; 1970; Nuclear Astrophysics, Advisor: Prof. W. A. Fowler (Caltech)
- M.S. Physics: Weizmann Institute of Science, Israel, 1965
- B.S. Physics/Mathematics: Hebrew University, Israel, 1963

## Positions Held

- 1989 – present**     **Department of Astrophysical Sciences, Princeton University**  
Professor of Astrophysical Sciences  
**Eugene Higgins Professor of Astrophysics (2007- Current )**  
**Director of Undergraduate Program (1993 - Current )**  
**Director, Council on Science and Technology, Princeton University (2000-2008)**
- 1983 – 1989**     **Space Telescope Science Institute**  
Head, Science Program Selection Office  
Chief, General Observer Support Branch
- 1971 – 1983**     **Department of Astrophysical Sciences, Princeton University**  
Senior Research Astronomer; Research Astronomer; Research Associate
- 1970 – 1971**     **Physics Department, California Institute of Technology**  
Research Fellow

## Awards & Honors

- **Henry Norris Russell Lectureship award of the American Astronomical Society for ‘*a lifetime of eminence in astronomical research*’ (2024)**
- **President’s Distinguished Teaching Award, Princeton University (2021)**
- **Nobel Day Lecturer, SURF (Sanford Underground Research Facility), SD (2022)**
- **Chair, Astronomy Section, National Academy of Sciences (2016 – 2019)**
- **Fellow of the American Academy of Arts and Sciences (elected 2014)**
- **Member, National Academy of Sciences, USA (elected 1997)**

- **Legacy Fellow of the American Astronomical Society** (elected **2020**)
- **Inaugural Alexander Science Lecturer**, Barnard College, Columbia University (**2022**)
- **The Antoinette de Vaucouleurs Medal, 2018-19** (UT Austin)
- **The John Marshall Memorial Lecture 2018**, AAANY, AMNH, New York
- **The Bennett-McWilliams 2014 Distinguished Lecture**, Carnegie Mellon University
- **The Cecilia Payne-Gaposkin Prize, Harvard University** (2012/13)
- **The Neta Bahcall Asteroid** (2012) [<http://ssd.jpl.nasa.gov/sbdb.cgi?sstr=137166>]
- **Distinguished Research Chair, Perimeter Institute for Theoretical Physics**, Ontario, Canada (2009 - 2012)
- **Honorary Degree, Doctor of Science, The Ohio State University** (2006)
- **Frontiers of Astronomy Lecturer, CWRU** (2009)
- **Evnin Lecturer, Princeton University** (2008)
- **William T. Patten Distinguished Lecturer, Indiana University** (2007)
- **Distinguished Caroline Herschel Visitor**, Hubble Space Telescope Science Institute (2007)
- **Sackler Scholar**, Tel-Aviv University (2006)
- **Emilio Segre Distinguished Lecturer** (2006)
- **Vice-President, American Astronomical Society** (1995-1998)
- **Century Lecturer of the American Astronomical Society** (1999-present)
- **Strum Lecturer**, Wesleyan University (2002)
- **Benjamin Dean Lecturer**, California Academy of Sciences (2001)
- **Capital Science Lecturer**, Carnegie Institution Washington, D.C. (2000/01)
- **Invited Centennial Paper** (Astrophysical Journal Centennial Issue) (1999)

- **Centennial Lecture**, American Astronomical Society (HAD) (1999)
- **Chancellor's Distinguished Lecturer**, LSU (1999)
- **Nobel Lecturer, Nobel Symposium**, Stockholm (1998)
- **Merle Kingsley Distinguished Fellow**, Caltech (1995)
- **Director, AURA Board** (1990-95)
- **Tinsley Visiting Professorship**, University of Texas ( 1988)
- **Councilor**, American Astronomical Society ( 1987-1990)

## **Selected Recent Activities**

- **Editorial Board Member, Publications of the National Academy of Sciences** (2009 - Current)
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- **Director, Undergraduate Program in Astrophysics**, Princeton University (1993 - Current)
- **Faculty Academic Adviser** (2009 - 2021), **Faculty Fellow** (2009 – Current), Forbes College, Princeton University
- **Astronomy Decadal Survey Consultation Committee, NAS** (2018 - 2020), and Report Reviewer (2021)
- **Chair, National Academy of Sciences, Astronomy Section**, (2016 – 2019)
- **NASA's James Webb Space Telescope Advisory Committee** (2009 - 2017)
- **Chair, Henry Draper Medal selection committee, National Academy of Sciences** (2016-17)
- **National Academy of Sciences**, Nominating Committee (2010 – 2012)
- **National Academy of Sciences**, various committees (2010 – Current: PNAS Cozzarelli Award; Watson Award; Draper Medal; Data-Share Committee; Publications Committee; Class Membership Committee)

- **National Judge**, Siemens Science Competition (2011)
- **2010 Decadal Survey in Astronomy**, Galaxies Across Cosmic Time Science Panel (2009-10)
- **Chair, Hubble Space Telescope TAC** (2010)
- 
- **Faculty Fellow**, Center for Jewish Life, Princeton University (1990 – 2009)  
**Board Member**, Center for Jewish Life, Princeton University (2007 – 2010)
- **Director, Council on Science and Technology** of Princeton University (2000 - 2008)
- **Director, Teaching Postdoctoral Fellowship Program in Science & Engineering**, Princeton University (2000 - 2008)
- **National Astronomy and Astrophysics Advisory Committee** (2003-2007)
- **Chair, Oversight Board, NASA's SIRTf Science Center** (1998-2001)
- **Chair, American Astronomical Society Century Lecture Program** (1999- 2004)
- **Member, Space Telescope Institute Council** (1993-1997)
- **Member, US National Committee to IAU** (1998-2004)
- **AURA Member Representative** (Assoc. Universities Research in Astronomy) (1995-2001)
- **Chair, Scientific Advisory Committee, Sloan Digital Sky Survey** (1990-1995)
- **Chair, Hubble Space Telescope Time Allocation Committee** (1994)
- **American Institute of Physics Committee on International Relations** (1990-1993)
- **AAS Membership Committee** (1987-1990)
- **Chair, AAS Committee on the Status of Women in Astronomy** (1983)

## **Publications**

1. "Lifetime Measurements of Some Rotational Levels by a New Recoil Method", (with D. Ashery, G. Goldring, A. Sprinzak and Y. Wolfson), *Nuclear Physics*, 77, 65 (1966).
2. "Lifetime Measurements of Some Rotational Levels by a New Recoil Method. II", (with D. Ashery, G. Goldring, A. Sprinzak and Y. Wolfson), *Nuclear Physics*, A101, 31 (1967).
3. "Solar Neutrinos and Low Energy Nuclear Cross-Sections", (with J.N. Bahcall, W.A. Fowler and G. Shaviv), *Physics Letters*, 26B, 359 (1968).
4. "Present Status of the Theoretical Predictions for the 37C1 Solar-Neutrino Experiment", (with J.N. Bahcall and G. Shaviv), *Physical Review Letters*, 20,1209 (1968).
5. "Mixing in the Sun and Neutrino Fluxes", (with J.N. Bahcall and R.K. Ulrich), *Astrophysical Letters*, 2, 91 (1968).
6. "Sensitivity of the Solar Neutrino Fluxes", (with J.N. Bahcall and R.K. Ulrich), *ApJ*, 156, 559 (1969).
7. "The Effect of Excited Nuclear States on Stellar Reaction Rates", (with W.A. Fowler), *ApJ*, 157, 645 (1969).
8. "Endoergic (p,n) and (a,n) and Their Reverse Reaction Rates", (with W.A. Fowler), *ApJ*, 157, 659 (1969).
9. "Nuclear Partition Functions for Stellar Reaction Rates", (with W.A. Fowler), *ApJ*, 161, 119 (1970).
10. "On the Galaxies in the Direction of TON256 and B264", (with J.N. Bahcall), *Publications of the Astronomical Society of the Pacific*, 82, 721 (1970).
11. "Galaxies in the Direction of QSOs with Small Redshifts", (with J.N. Bahcall), *Publications of the Astronomical Society of the Pacific*, 82, 1276 (1970).
12. "The Ionization Structure of a Nebula Photoionized by a Flat Spectrum", (with J.N. Bahcall and B.Z. Kozlovsky), *Astronomy and Astrophysics*, 13, 1 (1971).
13. "Relative Correlation of Large and Small Redshift QSOs with Clusters of Galaxies", (with J.N. Bahcall and G. Burbidge), *ApJL*, 166, L77 (1971).
14. "The Distribution of Galaxies in the Ursa Major II Cluster", *AJ*, 76, 995 (1971).



15. "Are Quasars Associated with Bright Galaxies?", (with J.N. Bahcall and C.F. McKee), *Astrophysical Letters*, 10, 147 (1972).
16. "The Distribution of Galaxies in the Cluster A31", *AJ*, 77, 550 (1972).
17. "Core Radii of Clusters of Galaxies at Different Redshifts", *ApJ*, 180, 699 (1972).
18. "The Period and Light Curve of HZ Herculis", (with J.N. Bahcall), *ApJL*, 178, L1 (1972).
19. "Observations of QSOs in the Direction of Clusters of Galaxies", (with M. Schmidt and J.N. Bahcall), *ApJ*, 183, 777 (1973).
20. "Structure of the Central Region of the Coma Cluster", *ApJ*, 183, 783 (1973).
21. "Optical Observations of HZ Herculis", Invited talk at the Sixth Texas Symposium on Relativistic Astrophysics, New York, December 1972; published in the *Annals of the New York Academy of Sciences*, 224, 178 (1973).
22. "The Galaxy Distribution in the Cluster A2199", *ApJ*, 186, 11 (1973).
23. "A Steady Energy Source in Her X1?", (with Y. Avni, J.N. Bahcall, P.C. Joss, F.K. Lamb, C.J. Pethick and D. Pines), *Nature*, 246, 36 (1973).
24. "The Perseus Cluster: Galaxy Distribution, Anisotropy, and the M/L Ratio", *ApJ*, 187, 439 (1974).
25. "Optical Properties of Binary X-ray Sources", Invited talk at the 16th Solvay Conference on Physics, Astrophysics and Gravitation, (1974).
26. "Near Infrared Observations of Cygnus X-3", (with J.N. Bahcall), *Nature*, 247, 446 (1974).
27. "Optical Properties of X-ray Clusters of Galaxies", *ApJ*, 193, 529 (1974).
28. "Positional Agreement between 3U1706+32 and the Cluster of Galaxies A2241", *Nature*, 252, 661 (1974).
29. "Optical and Near Infrared Observations of Seven Fields Containing X-ray Sources", (with J.N. Bahcall), *Proceedings of the International Conference on X-rays in Space*, Calgary, Alberta, Canada (1975).
30. "Core Radii and Central Densities of Fifteen Rich Clusters of Galaxies", *ApJ*, 198, 249 (1975).

31. "Extra Galactic X-ray Sources", Proceedings of the International Conference on X-rays in Space, August 1974 Calgary, Alberta, Canada (1975).
32. "Further Optical Observations of HZ Herculis", (with J.N. Bahcall, T. Herczeg, P. Joss, E. Leibowitz, A. Segalovitz, S. Stolero, M. Veron, P. Veron, P. Wehinger, D. Weistrop and S. Wycoff), Publications of the Astronomical Society of the Pacific, 87, 141 (1975).
33. "Properties of the Extra Galactic X-ray Sources", Seventh Texas Symposium on Relativistic Astrophysics, Dallas, Texas, December 1974; published in the Annals of the New York Academy of Sciences, 262, 361 (1975).
34. "Optical Studies of Ten High-Galactic Latitude X-ray Sources", (with J.N. Bahcall, M. Schmidt and S. Murray), ApJL, 199, L9 (1975).
35. "The Unidentified High Galactic Latitude Sources: Bright Galaxies or Rich Clusters", (with J.N. Bahcall), ApJL, 199, L89 (1975).
36. "The Star Distribution in M15", (with D. Weistrop and J.N. Bahcall), Astrophysical Letters, 16, 159 (1975).
37. "Optical Structure of the X-ray Globular Star Cluster NGC6624", ApJL, 204, L83 (1976).
38. "Statistical Simulation of Clusters of Galaxies", (with Y. Avni), ApJ, 209, 16 (1976).
39. "Optical Structure of the X-ray Globular Clusters NGC6440 and NGC644", (with M. Hausman), ApJL, 207, L181 (1976).
40. "Radio-Optical Candidates for the High-Latitude X-ray Sources 3U1555+27 and 3U1809+50", (with D. Harris and R. Strom), ApJL, 209, L17 (1976).
41. "Redshift of the Candidate X-ray Cluster of Galaxies, A2241", (with H. Spinrad), Publications of the Astronomical Society of the Pacific, 88, 660 (1976).
42. "Density Profiles in Clusters of Galaxies", Highlights of Astronomy, 4, Part I., 247 (1976).
43. "The Structure of Eight Globular Star Clusters", (with M. Hausman), ApJ, 213, 93 (1977).
44. "Radio and Optical Observations of Five Unidentified X-ray Sources at High Latitudes", (with D. Harris and R. Strom), Astronomy and Astrophysics, 60, 27 (1977).
45. "Clusters of Galaxies", Annual Review of Astronomy and Astrophysics, 15, 505 (1977).

46. "The Central Region of the X-ray Globular Cluster NGC 1851", (with B. Lasker and W. Wamsteker), *ApJL*, 213, L105 (1977).
47. "The Redshift and Optical Properties of the Cluster A478", (with W. Sargent), *ApJL*, 217, L19 (1977).
48. "X-ray Clusters of Galaxies: Correlation with Optical Morphology and Galaxy Density", *ApJL*, 217, L77 (1977).
49. "X-ray Clusters of Galaxies: Correlation of X-ray Luminosity with Galactic Content", *ApJL*, 218, L93 (1977).
50. "Large Scale Structure in the Universe", Rehovot, (1978).
51. "The Luminosity Function of Galaxy Systems: From Single Galaxies and Small Groups to Rich Clusters", *ApJ*, 232, 689 (1979).
52. "Brightness, Density, and Color Profiles of Three Globular Clusters: NGC6440, 6541, and 7099", (with T. Williams), *ApJ*, 232, 754 (1979).
53. "The X-ray Luminosity Function of Clusters of Galaxies: Predictions from a Thermal Bremsstrahlung Model", *ApJL*, 232, L83 (1979).
54. "Clusters of Galaxies", *Highlights of Astronomy*, 5, 699 (1980).
55. "The Optical and X-ray Luminosity Functions of Clusters of Galaxies", *Objects of High Redshift*, IAU Symposium, No. 92, 229 (1980).
56. "Optical Properties of Morgan's Poor Clusters", *ApJL*, 238, L117 (1980).
57. "The Relation Between Velocity Dispersion and Central Galaxy Density in Clusters of Galaxies", *ApJ*, 247, 787 (1981).
58. "Large-Scale Superclusters Surrounding the Giant Galaxy Void in Bootes", (with R. Soneira), *ApJL*, 258, L17 (1982).
59. "A  $\sim 300$  Mpc Void of Rich Clusters of Galaxies?", (with R. Soneira), *ApJ*, 262, 419 (1982).
60. "The Spatial Correlation Function of Rich Clusters of Galaxies", (with R. Soneira), *ApJ*, 270, 20 (1983).
61. "A Supercluster Catalog", (with R. Soneira), *ApJ*, 277, 27 (1984).

62. "Superclusters and the Large-Scale Structure of the Universe", *Advances in Space Research*, 3, 367 (1984).
63. "X-ray Emission from Stephan's Quintet and Other Compact Groups", (with D. Harris and H. Rood), *ApJL*, 284, L29 (1984).
64. "Superclustering of Galaxy Clusters", *Annals of the New York Academy of Sciences*, 470, 108 (1986).
65. "The Hubble Space Telescope", *Annals of the New York Academy of Sciences*, 470, 331 (1986).
66. "Are Superclusters Correlated on a Very Large Scale?", (with W. Burgett), *ApJL*, 300, L35 (1986).
67. "The Difference Between the Galaxy and Cluster Correlation Functions: A Manifestation of Tails of Galaxy Clusters", *ApJL*, 302, L41 (1986).
68. "Quasar Groups: Multiple Quasars for Multiple Images", (with J.N. Bahcall and D. Schneider), *Nature*, 323, 515 (1986).
69. "Peculiar Velocity and Geometrical Elongation of Large Scale Structures", (with R. Soneira and W. Burgett), *ApJ*, 311, 15-24 (1986).
70. "Peculiar Velocities on Large Scales", *Comments on Astrophysics*, 11, 6, 283 (1987).
71. "Large-Scale Structure in the Universe: Spatial Distribution and Peculiar Velocities", *Observational Cosmology, Proceedings of IAU Symposium 124*, eds. A. Hewitt, G. Burbidge, L.Z. Fang, August 1986, Peking, China (1987).
72. "Superclustering and Motion of Galaxy Clusters", *The Structure of the Universe, Proceedings of IAU Symposium 130*, eds. J. Audouze, A. Szalay, June 1987, Budapest, Hungary (1987).
73. "Large-Scale Structure in the Universe Indicated by Galaxy Clusters", *Annual Review of Astronomy and Astrophysics*, 26, 631 (1988).
74. "Large-Scale Structure and Motion in the Universe: A Vatican Study Week", eds. V. Rubin and G. Coyne, 79, Princeton University Press, (1988).
75. "The Correlation Function of Southern Clusters", (with D.J. Batuski and R.P. Olowin), *ApJL*, 333, L13 (1988).
76. "The Science Program of the Hubble Space Telescope", *Highlights of Astronomy*, 8, 435 (1989).

77. "The Distribution of Clusters in the Southern ACO Catalog", (with D.J. Batuski, R.P. Olowin, and J.O. Burns), *ApJ*, 341, 599 (1989).
78. "Is the Universe Filled with Bubbles?", (with M. Henriksen and E. Smith), *ApJL*, 346, L45 (1989).
79. "The Origin of Large-Scale Periodicity", in *After the First Three Minutes*, USRA, AIP Conference Proceeding, 222, 276 (1990).
80. "Clustering of Galaxies: Fractal or Homogeneous Infrastructure", (with D. Calzetti, M. Giavalisco, R. Ruffini, and S. Taraglio), *Astronomy and Astrophysics*, 245, 1 (1991).
81. "Quasar Superclustering", (with A. Chokshi), *ASP Conf. Series*, 21, 281, (1991).
82. "Superclusters and Pencil-Beam Surveys: The Origin of Large-Scale Periodicity", *ApJ*, 376, 43 (1991).
83. "The Non-Proprietary Snapshot Survey: A Search for Gravitationally Lensed Quasars Using the HST Planetary Camera", (with D. Maoz, J. Bahcall, R. Doxsey, D. Schneider, O. Lahav, B. Yanny), *The First Year of HST Observations*, ed. A. Kinney and C. Blades (Baltimore, STScI) p.200 (1991).
84. "The Origin of Quasar Correlations", (with A. Chokshi), *ApJL*, 380, L9 (1991).
85. "The Snapshot Survey: A Search for Gravitationally Lensed Quasars with the Hubble Space Telescope", (with D. Maoz, D. Schneider, J. Bahcall, B. Yanny, O. Lahav, R. Doxsey), *ApJ*, 387, 56 (1992).
86. "The Clustering of Radio-Galaxies", (with A.Chokshi), *ApJL*, 385, L33 (1992).
87. "The Distribution and Properties of Superclusters", in *Clusters and Superclusters of Galaxies*, NATO Advanced Study Institute, Kluwer Academic Publishers, ed. A.aC. Fabian, Cambridge, England, p.275 (1992).
88. "The Cluster Correlation Function: Consistent Results from an Automated Survey", (with M. West), *ApJ*, 392, 419 (1992).
89. "A Gravitational Lens Candidate Discovered with the Hubble Space Telescope", (with D. Maoz, J. Bahcall, D. Schneider, R. Doxsey, A. Filippenko, W.M. Goss, O. Lahav, B. Yanny), *ApJL*, 386, L1 (1992).
90. "A Unified Picture of Large-Scale Structure", *Highlights of Astronomy*, 9, 671-680, Kluwer Academic Publishers, ed. J. Bergeron (1992).

91. "Gravitational Lensing of Quasars as seen by the Hubble Space Telescope Snapshot Survey", (with D. Maoz, J. Bahcall, R. Doxsey, D. Schneider, O. Lahav, B. Yanny), *ApJ*, 394, 51 (1992).
92. "Accurate Positions and Finding Charts for 528 High-Redshifts Luminous Quasars", (with D. Schneider, J. Bahcall, D. Saxe, R. Doxsey, D. Golombek, J. Kriss, M. McMaster, M. Meakes, O. Lahav), *Publications of the Astronomical Society of the Pacific*, 104, 678 (1992).
93. "Clusters of Galaxies and CDM: A Low-Density Unbiased Universe?", (with R. Cen), *ApJL*, 398, L81 (1992).
94. "The Mass-Function of Clusters of Galaxies", (with R. Cen), *ApJL*, 407, L49 (1993).
95. "The Hubble Space Telescope Snapshot Survey III. Further Observations in Search of Gravitationally Lensed Quasars", (with D. Maoz, J. Bahcall, R. Doxsey, D. Schneider, O. Lahav, B. Yanny), *ApJ*, 402, 69 (1993).
96. "Cosmological Constant, COBE CMB Anisotropy and Large Scale Clustering", (with L. Kofman and N. Gnedin), *ApJ*, 413, 1 (1993).
97. "The HST Snapshot Survey IV. A Summary of the Search for Gravitationally Lensed Quasars", (with D. Maoz, J. Bahcall, R. Doxsey, D. Schneider, O. Lahav, B. Yanny), *ApJ*, 409, 28 (1993).
98. "Clusters, Superclusters and Large-Scale Structure - A Consistent Picture", *Colloquium on Physical Cosmology Proc. National Academy of Sciences, USA*, 90, 4828 (1993).
99. "Redshift Space Clustering and CDM", (with R. Cen and M. Gramann), *ApJL*, 408, L77 (1993).
100. "Clustering of Galaxies in Redshift Space: The Power-Spectrum and Correlation Function", (with M. Gramann and R. Cen), *ApJ*, 419, 440 (1993).
101. "The Relation Between Velocity Dispersion and Temperature in Clusters: Limiting the Velocity Bias", (with Lori Lubin), *ApJL*, 415, L17 (1993).
102. "Resolving the b-Discrepancy for Clusters of Galaxies", (with Lori Lubin), *ApJ*, 426, 513 (1994).
103. "The Correlation Function of Flux-Limited X-ray Clusters", (with R. Cen), *ApJL*, 426, L15 (1994).
104. "Clusters, Superclusters, and the Large Scale Structure", in *Evolution of the Universe and Its Observational Quest, Proceedings of the Yamada Conference 23*, ed. K. Sato, (Universal Academic Press: Tokyo, Japan), p.269 (1994).

105. "Probing the Large-Scale Velocity Field with Clusters of Galaxies", (with R. Cen and M. Gramann), *ApJL*, 430, L13 (1994).
106. "The Motions of Clusters and Groups of Galaxies", (with Mirt Gramann and Renyue Cen), *ApJ*, 436, 23 (1994).
107. "Dark Matter in Clusters and the Mass-Density of the Universe", in *Sources of Dark Matter in the Universe*, ed. D. Cline, World Scientific, p.41 (1994).
108. "Velocity Correlations of Galaxy Clusters", (with R. Cen and M. Gramann), *ApJL*, 437, L51 (1994).
109. "Large-Scale Motions in the Universe: Using Clusters of Galaxies as Tracers", (with M. Gramann, R. Cen, J.R. Gott), *ApJ*, 441, 449 (1995).
110. "Where is the Dark Matter?", (with Lori Lubin and Victoria Dorman), *ApJL*, 447, L81 (1995).
111. "Clustering and Large-Scale Structure with the Sloan Digital Sky Survey", *Publications of the Astronomical Society of the Pacific*, 107, 790 (1995).
112. "Cosmology with Clusters of Galaxies", in *Large Scale Structure in the Universe 11th Potsdam Cosmology Workshop*, World Scientific, p.209 (1995).
113. "Rating Cosmological Models", *Summary of the 11th Potsdam Cosmology Workshop on Large Scale Structure in the Universe*, World Scientific, p. 371(1995).
114. "Dark Matter in Clusters of Galaxies", in "Dark Matter", the 5th Astrophysics Maryland Conference, ed. S. Holt & C. Bennett, *AIP*, 336, 201 (1995).
115. "Clusters and Large Scale Structure", 17th Texas Symposium (Munich, 1994), *Annals of the New York Academy of Sciences*, 759, 636 (1995).
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