

GEORGE F. SMOOT
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Education

- Ph.D. Massachusetts Institute of Technology, Physics, 1970.
Thesis: "Charge Exchange of K^+ on Platinum at Three GeV."
- B.S. Massachusetts Institute of Technology, Mathematics and Physics, 1966.
Thesis: "Measurement of $\eta \rightarrow 3\pi^0$."
Georgetown University, Summer 1963.
Stetson University, Summer 1961.

Professional Experience

- 1994– Professor, Physics Department, University of California, Berkeley
- 1971– Research Physicist, University of California, Berkeley, Space Sciences Laboratory
- 1974– Joint appointment, Research Physicist, Lawrence Berkeley National Laboratory.
Primary research:
(1) Observational cosmology and particle physics utilizing the cosmic background radiation as a probe of the early universe. These include, work on COBE and Planck satellites, and airborne and ground-based experiments to extend anisotropy and spectrum measurements to greater accuracy. Also, work on the SNAP mission to utilize supernovae and gravitational lensing as cosmological probes.

(2) Cosmic radiation measurement utilizing balloon-borne superconducting magnetic spectrometers. Work on HEAO satellite cosmic ray experiment, including design and testing on one-year lifetime liquid helium cryostat containing a superconducting magnet. Design tests of total absorption shower counter and calorimeter at Bevatron, NAL, and SLAC. Work on Astronomy, a superconducting magnetic spectrometer for the Space Station. High-energy neutrino astronomy including work on AMANDA and IceCube projects.
- 1968–72 Co-Experimenter on experiment to test the $\Delta S = \Delta Q$ rule for weak interactions by measuring $K^0 \rightarrow \pi e \nu$ decays to observe the proper time evolution of K_{e3} decays in the first few K_S lifetimes.
- 1974–75 Member of APS Committee on the Safety of Commercial Nuclear Reactors
- 1976–80 Member of Management and Operations Working Group for Shuttle Astronomy
- 1975–97 Member of Steering Group on Cosmic Background Explorer satellite and Principal Investigator on isotropy experiment (NASA)
- 1982–90 Member of White Mountain Research Station Advisory Committee
- 1985–96 Member of Superconducting Magnet Facility for the Space Station Study Team as Magnet Scientist
- December 17, 2004

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- 1988-00 Member of The Center for Particle Astrophysics at the University of California, Berkeley
 - 1990-98 Member of Radio Astronomy Laboratory Advisory Committee
 - 1993- Member of Planck Mission Team.
 - 1996-0 Member of AMANDA Collaboration and IceCube Design Team.
 - 1996 Member of Lawrence Berkeley National Laboratory, Nuclear Science Division Search Committee
 - 1996- Member of The Advisory Committee for the Space Sciences Laboratory, University of California, Berkeley
 - 1997 Chairperson for the Director Search Committee, Space Science Laboratory, University of California, Berkeley
 - 2000- Member of SNAP Mission Team, Lawrence Berkeley National Laboratory

Honors, Awards and Affiliations

Sigma Xi
 American Physical Society
 American Astronomical Society
 American Association for Advancement of Science
 International Astronomical Union
 NASA Medal for Exceptional Scientific Achievement (May 1991)
 Popular Science Award (Nov 1992)
 Aerospace Laureate, Aviation Week & Space Technology (Apr 1993)
 1993 Distinguished Scientist, ARCS Foundation, Inc. (Apr 1993)
 Kilby Award (May 1993)
 Gravity Research Foundation Essay First Award (May 1993)
 Productivity Group Award, Goddard Space Flight Center, NASA (May 1993)
 American Achievement Golden Plate Award (June 1994)
 Lawrence Award (May 1995)
 Medal: Francois Fonde Le College De France (2002-2003)
 Einstein Medal, Albert Einstein Society, Switzerland (2003)
 Gruber Prize with John Mather (2006)
 Nobel Prize in Physics, with John Mather (2006)
 Daniel Chalonge Medal, International School of Astrophysics (2006)
 Member, International Raoul Wallenberg Foundation

Publications

1. "Search for Antimatter in the Primary Cosmic Rays," A. Buffington, L.H. Smith, G.F. Smoot, L.W. Alvarez, and M.A. Wahlig, *Nature* **236**, 335 (1972)
2. "Spatial Spark Jitter Measurements of Highly Charged Nuclei for Optical Spark Chambers," G.F. Smoot, A. Buffington, and L.H. Smith, *Review of Scientific Instruments* **43**, 9, 1285 (1972)
3. "Primary Ray Nuclear Rigidity Spectra," A. Buffington, L. Smith, L. Alvarez, G. Smoot, and M. Wahlig, Paper C1 **3**, *Proceedings of the Joint Meeting of the American Physical Society and the American Astronomical Society*, San Juan, Puerto Rico (1971) and IKK of Zentralstelle fur Atomickernenergie Documentation (1972)
4. "High Energy Particle Astronomy," A. Buffington, R.A. Muller, L.H. Smith, and G.F. Smoot, in "Astronomy from a Space Platform," *Science and Technology* **28**, 289 (1972)
5. "A Measurement of Cosmic Ray Rigidity Spectra Above 5 GV/c of Elements from Hydrogen to Iron," L.H. Smith, A. Buffington, G.F. Smoot, L. Alvarez, and M. Wahlig, *The Astrophysical Journal* **180**, 987 (1973)
6. "Measurements of Geomagnetic Cutoff Rigidities and Particle Fluxes below Geomagnetic Cutoff near Palestine, Texas," C.R. Pennypacker, G.F. Smoot, A. Buffington, R.A. Muller, and L.H. Smith, *Journal of Geophysical Research* **78**, 10, 1515 (1973)
7. "Test of the DS = DQ Rule in K_{e3} Decay," O. Fackler, D. Frisch, J. Martin, G.F. Smoot, and L. Sompayrac, *Physical Review Letters* **31**, 13, 847 (1973)
8. "Measurements of the Positron-Electron Ratio in the Primary Cosmic Rays from 5 to 50 GeV," A. Buffington, C.D. Orth, and G.F. Smoot, *Physical Review Letters* **33**, 34 (1974)
9. "A Bremsstrahlung-Identification Technique for Cosmic-Ray Electrons and Positrons," Andrew Buffington Charles D. Orth, and George F. Smoot, *Nuclear Instruments & Methods* **122**, 575 (1974)
10. "Superconducting Magnet and Cryostat for a Space Application," W.L. Pope, G.F. Smoot, L.H. Smith, and C.E. Taylor, *Adv. in Cryogenic Engineering* **20**, 47 (1974)
11. "Low-Heat-Leak Current Leads for Intermittent Use," G.F. Smoot, and W.L. Pope, *Adv. in Cryogenic Engineering* **20**, 304 (1974)
12. "Measurement of Primary Cosmic-Ray Electrons and Positrons from 4 to 50 GeV," A. Buffington, C.D. Orth, and G.F. Smoot, *The Astrophysical Journal* **199**, 669 (1975)
13. "Report to the American Physical Society by the Study Group on Light-Water Reactor Safety," H.W. Lewis, R.J. Budnitz, A.W. Castleman, D.E. Dorfan, F.C. Finlayson, R.L. Garwin, L.C. Hebel, S.M. Keeny, Jr., R.A. Muller, T.B. Taylor, G.F. Smoot, F. von Hippel, H. Bethe, W.K.H. Panofsky, and V.F. Weisskopf, *Reviews of Modern Physics* **47**, Summer (1975)

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14. "Search for Cosmic-Ray Antimatter," G.F. Smoot, A. Buffington and C.D. Orth, *Physical Review Letters* **35**, 258 (1975)
 15. "Nuclear Reactor Safety - The APS Submits Its Report," H. Lewis, et al., *Physics Today* **28**, 7, 38 (1975)
 16. " K^0 Production by K^+ on Platinum at 3 GeV/c," G.F. Smoot, O.D. Fackler, D.H. Frisch, J.F. Martin, and L.M. Sompayrac, *Nuclear Physics* **B96**, 379 (1975)
 17. "Low Gravity Phase Separator," J.C. Fletcher, G.F. Smoot, W.L. Pope, and L. Smith, *ERDA Energy Research Abstracts* **49338**, 5112 (1977)
 18. "The Primary Cosmic-Ray Ratio Fe/(C+O) above Several GeV/c," C. Orth, A. Buffington, T. Mast, and G. Smoot, LBL Report 6422 (1977)
 19. "Detection of Anisotropy in the Cosmic Blackbody Radiation," G.F. Smoot, M.V. Gorenstein and R.A. Muller, LBL Report 6468, *Physical Review Letters* **39**, 898 (1977)
 20. "Radiometer System to Map the Cosmic Background Radiation," Marc V. Gorenstein, Richard A. Muller, George F. Smoot, and J. Anthony Tyson, LBL Report 6493, *Rev. Sci. Instrum.* **49**, 4, 440 (1978)
 21. "Abundances and Spectra for Cosmic-Ray Nuclei from Lithium to Iron for 2 to 150 GeV per Nucleon," C.D. Orth, A. Buffington, G.F. Smoot, and T.S. Mast, *The Astrophysical Journal* **226**, 1147, (1978)
 22. "Search for Linear Polarization of the Cosmic Background Radiation," P.M. Lubin, and G.F. Smoot, LBL Report 8266, *Physical Review Letters* **42**, 129 (1979).
 23. "Pattern Measurements of a Low-Sidelobe Horn Antenna," M.A. Janssen, S.M. Bednarczyk, S. Gulkis, H.W. Marlin, and G.F. Smoot, *IEEE Transactions on Antennas and Propagation* **AP27**, 4, 551 (1979)
 24. "Southern Hemisphere Measurements of the Anisotropy in the Cosmic Microwave Background Radiation," G.F. Smoot, and P.M. Lubin, LBL Report 9282, *The Astrophysical Journal* **234**, L83-L86 (1979).
 25. "Fluctuations in the Microwave Background at Large Angular Scale," G.F. Smoot, *Physica Scripta* **21**, 619 (1980)
 26. "Large-Angular-Scale Anisotropy in the Cosmic Background Radiation," M.V. Gorenstein, and G.F. Smoot, *Proceedings of IAU Symposium* **92**, UCLA, Reidel (1980)
 27. "Large-Angular-Scale Anisotropy in the Cosmic Background Radiation," M.V. Gorenstein, and G.F. Smoot, *The Astrophysical Journal* **244**, 361 (1981)
 28. "Polarization of the Cosmic Background Radiation," P.M. Lubin, and G.F. Smoot, *The Astrophysical Journal* **245**, 1 (1981)
 29. "Comments and Summary on the Cosmic Background Radiation," G.F. Smoot, *Proceedings of IAU Symposium 104, Early Evolution of the Universe and Its Present Structure*, edited by G.O. Abell & G. Chincarini **153**, Reidel (1983)

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30. "3-mm Anisotropy Measurement and the Quadrupole Component in the Cosmic Background Radiation," P. Lubin, G. Epstein, and G. Smoot, *Physical Review Letters* **50**, 616 (1983)
 31. "Low-Frequency Measurement of the Spectrum of the Cosmic Background Radiation," G.F. Smoot, G. De Amici, S.D. Friedman, C. Witebsky, N. Mandolesi, R.B. Partridge, G. Sironi, L. Danese and G. De Zotti, *Physical Review Letters* **51**, 12, 1099 (1983)
 32. "Linear and Circular Polarization of the Cosmic Background Radiation," P. Lubin, P. Melese, and G. Smoot, *The Astrophysical Journal* **273**, L51-L54 (1983)
 33. "Measurements of the Cosmic Background Radiation Temperature at 3.3 and 9.1 mm," G. De Amici, C. Witebsky, G.F. Smoot, and S.D. Friedman, *Physical Review D*, Third Series **29**, 12, 2673 (1984), LBL Report 16180 (1983)
 34. "Measurement of the Cosmic Background Radiation Temperature at 3.0 cm," S.D. Friedman, G.F. Smoot, G. De Amici, and C. Witebsky, *Physical Review D* **29**, 12, 2677 (1984)
 35. "New Measurements of the Cosmic Background Radiation Spectrum," G.F. Smoot, G. De Amici, S. Levin, and C. Witebsky, *Cosmic Background Radiation and Fundamental Physics*, edited by F. Melchiorri, Proceedings of the Third Roma Meeting on Astrophysics, *Societa Italiana di Fisica* **1**, 27 (1985), LBL Report 18745 (1984)
 36. "Low-Frequency Measurements of the Cosmic Background Radiation Spectrum," G.F. Smoot, G. De Amici, S.D. Friedman, C. Witebsky, G. Sironi, G. Bonelli, N. Mandolesi, S. Cortiglioni, G. Morigi, R.B. Partridge, L. Danese and G. De Zotti, *The Astrophysical Journal* **291**, L23-L27 (1985), LBL Report 18602 (1984)
 37. "Simultaneous Measurements of Atmospheric Emission at 10, 33 and 90 GHz," J.B. Costales, G.F. Smoot, C. Witebsky, G. De Amici, and S.D. Friedman, *Radio Science* **21**, 1, 47, 1986, LBL Report 19495 (1984)

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38. "A Redetermination of the Spectrum of the Cosmic Background Radiation from 12 to 0.33 cm," R.B. Partridge, G. Sironi, G. Bonelli, L. Danese, G. De Zotti, G. De Amici, S.D. Friedman, G.F. Smoot, C. Witebsky, N. Mandolesi, S. Cortiglioni, and G. Morigi, *Cosmic Background Radiation and Fundamental Physics*, edited by F. Melchorri, Proceedings of the Third Roma Meeting on Astrophysics, *Societa Italiana di Fisica* **1**, 7 (1985)
 39. "A map of the cosmic background radiation at 3 millimeters," P. Lubin, T. Villela, G. Epstein, and G. Smoot, *Astrophysical Journal Letters* **298**, L1-L5 (1985)
 40. "New 33 GHz Measurements of the Cosmic Background Radiation Intensity," G. De Amici, G. Smoot, S.D. Friedman, and C. Witebsky, *The Astrophysical Journal* **298**, 710-731 (1985), LBL Report 19323 (1985)
 41. "The Spectrum of the Cosmic Background Radiation: Early and Recent Measurements from the White Mountain Research Station," G.F. Smoot, *White Mountain Symposium Proceedings* (1986), LBL Report 20344 (1985)
 42. "Atmospheric Emission Variation Measurements at 3, 0.9, and 0.33 cm Wavelength", G.F. Smoot, S.M. Levin, A. Kogut, G. De Amici, and C. Witebsky, *Radio Science* **22**, 3, 521 (1987) LBL Report 19622 (1985)
 43. "Cosmic Microwave Background Spectrum Measurements," G.F. Smoot, *Highlights of Astronomy 1985* **297**, Reidel (1986).
 44. "New Measurements of the Cosmic Background Radiation Temperature at 3.3 mm Wavelength," Chris Witebsky, George Smoot, Giovanni De Amici, and Scott D. Friedman, *The Astrophysical Journal* **310**, 145 (1986)
 45. "ASTROMAG: A Superconducting Particle Astrophysics Magnet Facility for the Space Station," M.A. Green, G.F. Smoot, R.L. Golden, M.H. Israel, R. Kephart, R. Niemann, R.A. Mewalt, J.F. Ormes, P. Spillantini, and M.E. Widenbeck, LBL Report 22343 (1986), *IEEE Transactions on Magnetics* MAG-23, 1 (1987).
 46. "A Large L-Band Rectangular Corrugated Horn," C. Witebsky, G. Smoot, S. Levin, and M. Bensadoun. *IEEE Transactions on Antennas and Propagation* AP-35, 11, 1310 (1987)
 47. "Long Wavelength Measurements of the Cosmic Microwave Background Radiation Spectrum," G.F. Smoot, Marc Bensadoun, Marco Bersanelli, Giovanni De Amici, Alan Kogut, Steve Levin, and Chris Witebsky, *The Astrophysical Journal* **317**, L45-L49 (1987)
 48. "An Analysis of Recent Measurements of the Temperature of the Cosmic Microwave Background Radiation," George Smoot, Chris Witebsky, Giovanni De Amici, Steve Levin, and Yoel Rephaeli, *The Astrophysical Journal* **331**, 653 (1988)
 49. "Measurement of the Intensity of the Cosmic Background Radiation at 3.7 GHz," Giovanni De Amici, George Smoot, Jon Aymon, Marco Bersanelli, Alan Kogut, Steve Levin, and Chris Witebsky, *The Astrophysical Journal* **329**, 190 (1988)
 50. "The Temperature of the Cosmic Microwave Background Radiation at a Frequency of 10 GHz," Alan Kogut, Marco Bersanelli, G. De Amici, Scott Friedman, Mark Griffith,

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- Bruce Grossan, Steve Levin, George Smoot, and Chris Witebsky, *The Astrophysical Journal* **325**, 39 (1988)
51. "A Measurement of the Cosmic Microwave Background Radiation Temperature at a Frequency of 1.410 GHz," Steve Levin, Chris Witebsky, Marc Bensadoun, Marco Bersanelli, Giovanni De Amici, Alan Kogut, and George Smoot, *The Astrophysical Journal* **334**, 14-21 (1988)
 52. "Cosmological Implications from Recent Spectral Measurements of the Microwave Background Radiation," Yoel Rephaeli, and George Smoot, *Proceedings of the Moriond Dark Matter Conference* (1988) *
 53. "The COBE Cosmic 3 K Anisotropy Experiment: A Gravity Wave and Cosmic String Probe," C. Bennett, and G. Smoot, *Proceedings of the NASA Workshop on Gravitation, Annapolis, Maryland* (1988) *
 54. "Technical Aspects of a Germanium Calorimeter for Space-borne Gamma-ray Detection," H. Crawford and G. Smoot, LBL Report 25514 (1988)
 55. "Measurements of Very Low-Sidelobe Conical Horn Antennas," Marco Toral, Roger Ratliff, Maria Lecha, John Maruschak, Charles Bennett, and George Smoot, *The IEEE Transactions on Antennas and Propagation* **37**, 2 (1989)
 56. "Cosmic Background Radiations," George Smoot, *Proceedings of the Third International Workshop on Data Analysis in Astronomy*, 291-318, Plenum Press (1989) *
 - 56a. "Low Frequency Measurements of the CMB Spectrum," A. Kogut, M. Bensadoun, G. De Amici, S. Levin, M. Limon, G.F. Smoot, G. Sironi, M. Bersanelli, G. Bonelli, *AIP Conference Proceedings*, Mullan, Pomerants & Stanev Ed., 198,24 (1989)*
 57. "Cosmic Background Explorer (COBE) Satellite Anisotropy Experiment Data Analysis Techniques," S. Torres, J. Aymon, C. Backus, C. Bennett, S. Gulkis, R. Hollenhorst, D. Hon, Q.H. Huang, M. Janssen, S. Keihm, L. Olson, G. Smoot, E. Wright, *Proceedings of the Third International Workshop on Data Analysis in Astronomy*, 319-334, Plenum Press (1989) *
 58. "Formaldehyde Absorption toward W51," A. Kogut, G. Smoot, C.L. Bennett, and S.J. Petuchowski, *The Astrophysical Journal* **346**, 763 (1989)
 59. "Formaldehyde Measurements at 2 mm," A. Kogut, G.F. Smoot, C.L. Bennett, S.J. Petuchowski, in *Particle Astrophysics: Forefront Experimental Issues*, edited by E.B. Norman, World Scientific, Singapore, (1989)
 60. "Measurements of the Cosmic Microwave Background Radiation Temperature at 90 GHz," M. Bersanelli, C. Witebsky, M. Bensadoun, G. De Amici, A. Kogut, S. Levin, and G.F. Smoot, *The Astrophysical Journal* **339**, 632 (1989)
 61. "Low-frequency Measurements of the Cosmic Microwave Background Radiation," S. Levin, M. Bensadoun, M. Bersanelli, G. De Amici, A. Kogut, G.F. Smoot, C. Witebsky; in: *Particle Astrophysics: Forefront Experimental Issues*, edited by E.B. Norman, 130, World Scientific, Singapore (1989) *

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62. "Cosmic Microwave Background Session Summary," G.Smoot; in: Particle Astrophysics: Forefront Experimental Issues, edited by E.B. Norman, 130 *World Scientific*, Singapore (1989) *
 63. "The Temperature of the Cosmic Background Radiation: Results from the 1987 and 1988 Measurements at 3.8 GHz," G. De Amici, M. Bensadoun, M. Bersanelli, A. Kogut, S. Levin, G. Smoot, and C. Witebsky, *Astrophysical Journal* **359**, 219 (1990)
 64. "In Situ Measurement of the Cosmic Microwave Background Temperature at a Distance of 7.5 Kiloparsecs," A. Kogut, S.J. Petuchowski, C.L. Bennett, and G.F. Smoot, *Astrophysical Journal* **348**, L45-L48 (1990)
 65. "A Measurement of the Temperature of the Cosmic Microwave Background at a Frequency of 7.5 GHz," A. Kogut, M. Bensadoun, G. De Amici, S. Levin G. Smoot, and C. Witebsky, *Astrophysical Journal* **355**, 102 (1990)
 66. "COBE Differential Microwave Radiometers (DMR): Instrument Design and Implementation," G. Smoot, C. Bennett, R. Weber, J. Maruschak, R. Ratliff, M. Janssen, J. Chitwood, L. Hilliard, M. Lecha, R. Mills, R. Patschke, C. Richards, C. Backus, J. Mather, M. Hauser, R. Weiss, D. Wilkinson, S. Gulkis, N. Boggess, E. Cheng, T. Kelsall, P. Lubin, S. Meyer, H. Hoseley, T. Murdock, R. Shafer, R. Silverberg, and E. Wright, *Astrophysical Journal* **360**, 685 (1990)
 67. "A Preliminary Measurement of the Cosmic Microwave Background Spectrum by the Cosmic Background Explorer (COBE) Satellite," J.C. Mather, E.S. Cheng, R.E. Eplee, Jr., R.B. Isaacman, S.S. Meyer, R.A. Shafer, R. Weiss, E.L. Wright, C.L. Bennett, N.W. Boggess, E. Dwek, S. Gulkis, M.G. Hauser, M. Janssen, T. Kelsall, P.M. Lubin, S.H. Moseley, Jr., T.L. Murdock, R.F. Silverberg, G.F. Smoot, and D.T. Wilkinson, *Astrophysical Journal* **354**, L37-L40 (1990)
 68. "ASTROMAG: Current Capabilities and Status," L.M. Barbier, E.R. Christian, J.F. Ormes, and G.F. Smoot, III, *Nuclear Physics B* **14B**, 3 (1990)
 69. "The ASTROMAG Facility," G.F. Smoot; in: AIP Conference Proceedings 203, edited by W. Jones et al, *Particle Astrophysics* (AIP, New York) **67** (1990) *
 70. "Early Results From The Cosmic Background Explorer (COBE)," with J. Mather, M.G. Hauser, C.L. Bennett, N.W. Boggess, E.S. Cheng, R.E. Eplee, Jr., H.T. Freudenreich, S. Gulkis, R.B. Isaacman, M. Janssen, T. Kelsall, C.M. Lisse, P.M. Lubin, S.S. Meyer, S.H. Moseley, Jr., T.L. Murdock, R.A. Shafer, R.F. Silverberg, G.F. Smoot, W.J. Spiesman, G.N. Toller, L. Weiland, R. Weiss, D.T. Wilkinson, and E.L. Wright, *Proceedings 29th Liege Colloquium From Ground-based to Space-Borne Sub-mm Astronomy*, North Holland Press (1990) *
 71. "Cosmic Background Radiation; the Next 25 Years," G.F. Smoot, *The Cosmic Microwave Background: 25 Years Later*, **229** edited by N. Mandolesi and N. Vittorio, Kluwer, Amsterdam (1990) *
 72. "Cosmic Background Radiation Physics," G.F. Smoot, AIP Conference *Proceedings 202, Physics and Astrophysics from a Lunar Base*, **205** edited by A.E. Potter et al, AIP, New York (1990)*

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73. "COBE: New Sky Maps of the Early Universe" G.F. Smoot, IUPAP Conference Proceedings in: *Primordial Nucleosynthesis and Evolution of Early Universe*, edited by K. Sato and J. Audouze, Kluwer (1990) *
74. "A Millimeter-Wave Anisotropy Experiment (MAX) to Search for Anisotropy in the Cosmic Background Radiation on Medium Angular Scales", M.L. Fischer, D.C. Alsop, A.C. Clapp, D.A. Cottingham, A.E. Lange, P.L. Richards, G.F. Smoot, J.O. Gundersen, T.C. Koch, P.R. Meinhold, P.M. Lubin, E.S. Cheng, and E. Kreysa, "After the First Three Minutes" edited by Holt, Bennett & Trimble, *AAIP Conference Proceedings 222*, University of Maryland, College Park, (1990) *
75. "ASTROGAM: Gamma Ray Astronomy with a Magnetic Rigidity Spectrometer," J. Adams, Jr., S. Ahlen, L. Barbier, J. Beatty, P. Carlson, H. Crawford, R. Golden, K. Krombel, R. Lamb, J. Lloyd-Evans, A. Marin, J. Ormes, M. Ozel, G. Smoot, R. Streitmatter, A. Tylka, T. Weekes, and B. Zhou, *21st International Cosmic Ray Conference*, Adelaide, 1990, 4 edited by R.J. Protheroe, et al, University of Adelaide (OG Sessions) (1990)*
76. "Early Results From The Cosmic Background Explorer (COBE)," J.C. Mather, M.G. Hauser, C.L. Bennett, N.W. Boggess, E.S. Cheng, R.E. Eplee, Jr., H.T. Freudenreich, R.B. Isaacman, T. Kelsall, C.M. Lisse, S.H. Moseley, Jr., R.A. Shafer, R.F. Silverberg, W.J. Spiesman, G.H. Toller, J.L. Weiland, S. Gulkis, M. Janssen, P.M. Lubin, S.S. Meyer, R. Weiss, T.L. Murdock, G.F. Smoot, D.T. Wilkinson, and E.L. Wright, *Advances in Space Research* **11**, 2, 210 (1991)
77. "First Results of the COBE Satellite Measurement of the Anisotropy of the Cosmic Microwave Background Radiation," G.F. Smoot, C.L. Bennett, A. Kogut, J. Aymon, C. Backus, G. De Amici, K. Galuk, P.D. Jackson, P. Keegstra, L. Rokke, L. Tenorio, S. Torres, S. Gulkis, M.G. Hauser, M. Janssen, J.C. Mather, R. Weiss, D.T. Wilkinson, E.L. Wright, N.W. Boggess, E.S. Cheng, T. Kelsall, P. Lubin, S. Meyer, S.H. Moseley, T.L. Murdock, R.A. Shafer, and R.F. Silverberg, *Advances in Space Research* **11**, 2, 193 (1991)
78. "Preliminary Results from the COBE Differential Microwave Radiometers: Large Angular Scale Isotropy of the Cosmic Microwave Background," G.F. Smoot, C.L. Bennett, A. Kogut, J. Aymon, C. Backus, G. De Amici, K. Galuk, P.D. Jackson, P. Keegstra, L. Rokke, L. Tenorio, S. Torres, S. Gulkis, M.G. Hauser, M.A. Janssen, J.C. Mather, R. Weiss, D.T. Wilkinson, E.L. Wright, N.W. Boggess, E.S. Cheng, T. Kelsall, P. Lubin, S. Meyer, S.H. Moseley, T.L. Murdock, R.A. Shafer, and R.F. Silverberg, *Astrophysics Journal* **371**, L1-L5, (1991)
79. "First Results of the COBE Satellite Measurement of the Anisotropy of the Cosmic Microwave Background Radiation," G.F. Smoot, C.L. Bennett, A. Kogut, J. Aymon, C. Backus, G. De Amici, K.G. Galuk, P.D. Jackson, P. Keegstra, L.A. Rokke, L. Tenorio, S. Torres, S. Gulkis, M.G. Hauser, M. Janssen, J.C. Mather, R. Weiss, D.T. Wilkinson, E.L. Wright, N.W. Boggess, E.S. Cheng, T. Kelsall, P. Lubin, S.T. Meyer, S.H. Moseley, T.L. Murdock, R.A. Shafer, and R.R. Silverberg, *Physical Cosmology*, edited by A. Blanchard, L. Celnikier, M. Lachieze-Rey, and J. Tran Thanh Van, Editions Frontiers (1991) *
80. "Preliminary Results from the COBE Differential Microwave Radiometers: Large-angular-scale Isotropy of the Cosmic Microwave Background," G.F. Smoot, et al; *COBE Primordial Nucleosynthesis & Early Universe Conference Proceedings*, Tokyo, 90-07 (1991) *

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81. "Preliminary DMR Measurement of the CMB Anisotropy," G.F. Smoot, C.L. Bennett, A. Kogut, J. Aymon, C. Backus, G. De Amici, K. Galuk, P.D. Jackson, P. Keegstra, L. Rokke, L. Tenorio, S. Gulkis, M.G. Hauser, M. Janssen, J.C. Mather, R. Weiss, D.T. Wilkinson, E.L. Wright, N.W. Boggess, E.S. Cheng, T. Kelsall, P. Lubin, S. Meyer, S.H. Moseley, T.L. Murdock, R.A. Shafer, and R.F. Silverberg, *After the First Three Minutes*, **222, 95**, *Workshop Proceedings*, University of Maryland, College Park, edited by Holt, Bennett & Trimble, AIP, New York, (1991).
 82. "A Decade of Long-wavelength CMB Measurements," A. Kogut, M. Bersadoun, M. Bersanelli, G. De Amici, S. Levin, M. Limon, and G.F. Smoot, *After the First Three Minutes*, edited by Holt, Bennett & Trimble, *AAIP Conference Proceedings* **222**, University of Maryland, College Park, (1991) *
 83. "Observational Tests of Cosmological Inflation," G.F. Smoot, NATO ASI Series, *Series C: Mathematical and Physical Sciences* **348**, edited by T. Shanks, et al, (1991) *
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