Curriculum Vitae

Name: Charles Dennison Dermer

Occupation: Astrophysicist

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Place and Date of Birth: Scottsbluff, Nebraska, USA; 12 October 1954

Research Interests: High Energy Astrophysics and Gamma Ray Astronomy; Gamma-Ray Bursts; Blazars and Active Galactic Nuclei; Positron Astrophysics; Solar Flares Physics; Neutron Stars and Black Holes; Starburst Galaxies and Clusters; Cosmic Rays/Ultra-High Energy Cosmic Rays

Present Positions: Affiliate Professor, Physics and Astronomy Department, George Mason University, Aug 2009 –

Research Professor of Physics, Department of Physics, The George Washington University, 2013 –

Previous Positions: 1992-2015, Astrophysicist, Head of the Space Radiations Section of the High Energy Space Environment Branch in the Space Science Division of the Naval Research Laboratory.

1991 – 1992, Research Scientist, Department of Space Physics and Astronomy, Rice University, Houston, TX.

1990, Research Physicist, Berkeley Space Sciences Laboratory.

1987 – 1989, Postdoctoral Research Physicist, Lawrence Livermore National Laboratory.

1986, Postdoctoral Research Associate, University of Maryland.

1984 – 86, National Academy of Sciences/National Research Council Postdoctoral Research Associate, Goddard Space Flight Center, Greenbelt, Maryland.

Education: Ph.D., 1984, University of California, San Diego, Physics, supervisor: Robert J. Gould

M.S., 1980, University of California, San Diego, Physics.

M.A., 1979, Dartmouth College, Hanover, New Hampshire, Physics.

B.S., 1977, Harvey Mudd College, Claremont, California, Physics.

Professional Society Memberships: American Physical Society, American Astronomical Society

Visiting Lectureships: Distinguished Visiting Professor of the Mexican Academy of Sciences; Instituto Nacional de Astrofísica, Óptica y Electrónica, Puebla, Mexico, 10 – 14 August, 2015

Lecturer at the Fermi Summer School, Lewes, Delaware, 31 May – 10 June, 2011,
27 May – 6 June, 2014

Saas-Fee Lecturer, Les Diablerets, Switzerland, 15 – 20 March, 2010

Visiting Professor at the International La Plata School in Astrophysics, La Plata, Argentina, 10 – 14 March, 2008

Review and Executive Committees:

NASA Astrophysics Theory Review, 2013

NASA Einstein Fellowship Review, 2011

Full GLAST/Fermi Collaboration Member, 2007 – 2014

Advanced Compton Telescope Science Working Group, 2005 – 2010

NASA Senior Review, 2006

Councilor, Division of Astrophysics (DAP) of the American Physical Society (APS), 2006 – 2009

VERITAS External Oversight Committee, 2003-2009

NASA Structure and Evolution of the Universe Subcommittee, 2001 – 2004

Chair, DAP/APS, 1999-2003

NASA South Carolina EPSCOR Review, 2003

International Gamma-ray Astronomy Laboratory (INTEGRAL) Time Allocation Committee, 2001, 2003

High Energy Neutrino Astrophysics Panel of the Particle and Nuclear Astrophysics and Gravitation International Committee of the International Union of Pure and Applied Physics, 2000-2002

Gamma-ray Large Area Space Telescope (GLAST) Science Working Group and GLAST Interdisciplinary Scientist, 2000-2009

GLAST Facility Science Team, 1999

NASA Astrophysical Theory Program Review, 1999

Executive Committee Member, High Energy Astrophysics Division, American Astronomical Society, 1995-1997

Executive Committee Member-at-Large, DAP/APS (1996-1998)

NASA Long Term Space Astrophysics Program Review: 1991, 1994

NASA ASCA Guest Investigator Program Review: 1995
of the American Astronomical Society, San Diego, CA, 29 April - 4 May 1996

NASA Astrophysics Data Program Review: 1996

NASA Compton Gamma-Ray Observatory Guest Investigator Program Review: 1993, 1994, 1995 (panel chair), 1998

Scientific Organizing Committees:

Third Fermi Symposium, Monterey, California, 28 October – 2 November, 2012

Fermi and Jansky—Our Evolving Understanding of AGN, Harbourtowne Conference Center, St. Michaels, MD, 10 – 12 November, 2011

Second Fermi Symposium, Rome, Italy, 9 – 12 May, 2011

Finland Gamma-Ray Galaxies Workshop, 11 – 15 April, 2011

Fermi Meets Jansky—AGN in Radio and Gamma Rays, 21 – 23 June, 2010, Bonn, Germany

First Fermi Symposium, Washington, DC, 2 – 5 November, 2009

Variability in Blazars, 22 – 25 April, 2008 at the Ecole Polytechnique, Paris, France

The Multi-Messenger Approach to Gamma-Ray Sources, Barcelona, Spain, 4 – 7 July, 2006

Tenth Marcel Grossmann Meeting on General Relativity, Rio de Janeiro, 20 – 26 July, 2003

DAP Program Chair for the April 2001 Washington, DC APS Meeting

Fourth Compton Symposium, Williamsburg, VA, 28 – 30 April 1997

Workshop on the TeV Astrophysics of Extragalactic Sources, 23 – 24 October, 1998, Cambridge, Massachusetts.

Meeting of the High Energy Astrophysics Division of the American Astronomical Society, San Diego, CA, 29 April – 4 May 1996

Graduate Students: Steven J. Sturner, Rice University, Ph.D. 1993; Hui Li, Rice University, Ph.D. 1995

Scientific Advisory: NRL/NRC Postdoctoral Research Associateships Program. Research Associates:

Dr. Justin Finke, Dr. Soebur Razzaque, Dr. Jeffrey G. Skibo, Dr. Steven J. Sturner,
Dr. James Chiang, Dr. Stuart D. Wick, Dr. Truong Le.
German Academic Exchange Service: Dr. Markus Böttcher.
American Society for Engineering Education (ASEE) Postdoctoral Fellowship Program:
Dr. Robert Berrington.
NRL Science, Technology and Engineering Program (STEP): Ms. Hannah Krug
ASEE Summer Faculty Research Program: Professor Stanley P. Davis (Lincoln University),
Professor Mayer Humi (Worcester Polytechnic University), Professor Govind Menon
(Troy University).
DoD Science and Engineering Apprenticeship Program:
Mr. Kurt E. Mitman (Thomas Jefferson High School for Science and Technology; 1999),
Mr. Jeremy M. Holmes (TJHSST; 2004), Ms. Gauri Powale (Broad Run High School; 2011)

Honors and Awards: Fellow of the American Physical Society, 1999
NASA Group Achievement Award to Large Area Telescope Team, 2008
Alan Berman Research Publication Award, NRL, 2009, 2013
2009 Naval Research Laboratory E. O. Hulburt Annual Science Award
2011 Rossi Prize of the High Energy Astrophysics Division of the American Physical Society to
Peter Michelson, Bill Atwood, and the Fermi Gamma Ray Space Telescope LAT team

Books: *Proceedings of the Fourth Compton Symposium*, eds. C. D. Dermer, M. S. Strickman,
and J. D. Kurfess (New York: AIP), 1997.
Part 1: The Compton Observatory in Review;
Part 2: Papers and Presentations

High Energy Radiation from Black Holes, by Charles D. Dermer and Govind Menon
Princeton University Press, Nov. 2009, 512 pp.

Astrophysics at Very High Energies, by Felix Aharonian, Lars Bergström, & Charles D. Dermer
Springer, Saas-Fee Advanced Course 40, Swiss Society for Astrophysics and Astronomy,
2013, 361 pp.

March 2017

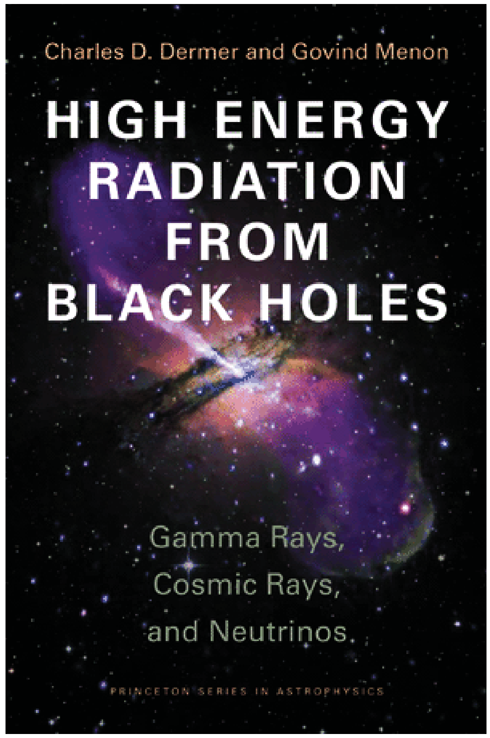

Figure 1: Cover for High Energy Radiation from Black Holes, by Charles D. Dermer and Govind Menon

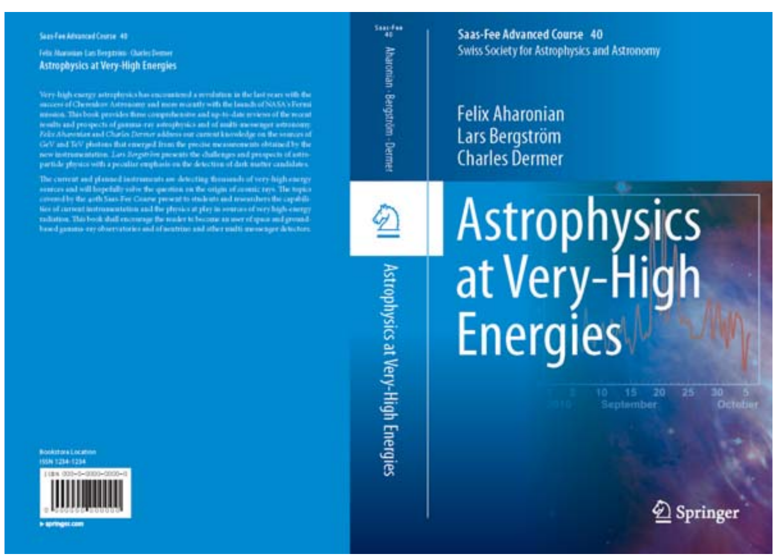

Figure 2: Cover for Astrophysics at Very High Energies, by Felix Aharonian, Lars Bergström, & Charles D. Dermer

Publications: Charles D. Dermer

1979

1. "Ultrasound Attenuation in Solid CD_4," with F. A. Stahl and R. P. Wolf, 1979, *Journal of Physics and Chemistry of Solids*, **40**, 191.
2. "Temperature Derivative of the Electronic Work Function of Copper at Low Temperature," with J. U. Free and P. B. Pipes, 1979, *Physical Review*, **B19**, 631.

1984

3. "The Production Spectrum of a Relativistic Maxwell-Boltzmann Gas," 1984, *Astrophysical Journal*, **280**, 328.

1985

4. "Binary Collision Rates of Relativistic Thermal Plasmas. I. Theoretical Framework," 1985, *Astrophysical Journal*, **295**, 28.
5. "Secondary Production of Antiprotons in Relativistic Plasmas," with R. Ramaty, 1985, in *Proceedings of the XIXth International Cosmic Ray Conference*, **2**, 338.

1986

6. "Directionality of Bremsstrahlung from Relativistic Electrons in Solar Flares," with R. Ramaty, 1986, *Astrophysical Journal*, **301**, 962.
7. "Binary Collision Rates of Relativistic Thermal Plasmas. II. Spectra," 1986, *Astrophysical Journal*, **307**, 47.
8. "Secondary Production of Neutral Pi-mesons and the Diffuse Galactic Gamma Radiation," 1986, *Astronomy and Astrophysics*, **157**, 223.
9. "Secondary Production of Antiprotons in Relativistic Plasmas," with R. Ramaty, 1986, *Nature*, **319**, 205.
10. "Neutron and Antineutron Production in Accretion onto Compact Objects," with R. Ramaty, 1986, in *Accretion Processes in Astrophysics*, eds. J. Audouze and J. Tran Thanh Van (Editions Frontieres), p. 85.
11. "Pion-Decay Radiation and Two-Phase Acceleration in the June 3, 1982 Solar Flare," 1986, with R. Ramaty and R. J. Murphy, *Advances in Space Research*, **6**, 119.

1987

12. "High Energy Processes in Solar Flares," with R. J. Murphy and R. Ramaty, 1987, *Astrophysical Journal Supplements*, **63**, 721.
13. "On the Origin of the Pion-Decay Radiation in the June 3, 1982 Solar Flare," 1987, with R. Ramaty and R. J. Murphy, *Astrophysical Journal Letters*, **316**, L41.
14. "On the Relationship of Flare Size and Particle Anisotropy in Solar Gamma-Ray Flares," 1987, *Astrophysical Journal*, **323**, 795.

1988

15. "Model for the Continuum Emission of Active Galactic Nuclei," 1988, in *Proceedings of the Georgia State University Conference on Active Galactic Nuclei*, eds. H. R. Miller and P. J. Wiita (Springer-Verlag: New York), p. 217.
16. "Laser Cooling of Positronium," 1988, with Edison P. Liang, *Optics Communications*, **65**, 419.
17. "Interpretation of the Gamma-Ray Bump from Cygnus X-1," 1988, with Edison P. Liang, *Astrophysical Journal Letters*, **325**, L39.

18. "Diffuse Hard X-Ray and Gamma-Ray Emission from M87," 1988, with Y. Rephaeli, *Astrophysical Journal*, **329**, 687.

19. "Properties of Hydrogen/Helium Accretion Plasmas," 1988, with N. Guessoum, in *Nuclear Spectroscopy of Astrophysical Sources*, eds. N. Gehrels and G. J. Share (AIP: New York), p. 332.

20. "Gamma Rays from Cygnus X-1: Modeling and Nonthermal Pair Production," 1988, with E. P. Liang, in *Nuclear Spectroscopy of Astrophysical Sources*, eds. N. Gehrels and G. J. Share (AIP: New York), p. 326.

21. "Hot Ion Model for the X-Ray Spectra of Active Galactic Nuclei," 1988, *Astrophysical Journal Letters*, **335**, L5.

1989

22. "Photoexcitation and Cooling of Positronium," 1989, with R. H. Howell, K. M. Jones, E. P. Liang, F. Magnotta, and K. P. Ziock, in *Eighth International Conference on Positron Annihilation* (World Scientific: Singapore), p. 292.

23. "Electron Thermalization and Heating in Relativistic Plasmas," 1989, with Edison P. Liang, *Astrophysical Journal*, **339**, 512.

24. "Compact Source Origin of Cosmic Ray Antiprotons," 1989, in *Particle Astrophysics: Forefront Experimental Issues*, ed. B. Saudolet (World Scientific: Singapore), p. 244.

25. "Perturbative Analysis of Simultaneous Stark and Zeeman Effects on n=1→ n=2 Radiative Transitions in Positronium," 1989, with J. C. Weisheit, *Physical Review A*, **40**, 5526.

26. "Thermal Comptonization Models for Gamma-Ray Emission from Black-Hole Sources," 1989, in *14th Texas Symposium on Relativistic Astrophysics*, ed. E. Fenyves (New York Academy of Sciences, New York), p. 513.

27. "Compton Scattering in Strong Magnetic Fields and the Paucity of X-Rays in Gamma-Ray Burst Spectra," 1989, *Astrophysical Journal Letters*, **347**, L13.

28. "Use of the EGRET Instrument in Studies of the Origin of the Cosmic Radiation," 1989, in *Proceedings of the Gamma Ray Observatory Science Workshop*, ed. W. N. Johnson, p. 4-124.

29. "Ion-Heated Thermal Comptonization Models and X-Ray Spectral Correlations in Active Galactic Nuclei," 1989, in *Proceedings of The 23rd ESLAB Symposium on Two Topics in X-Ray Astronomy*, ed. N. White (ESA SP-296), p. 925.

1990

30. "Optical Saturation of the $1^3S - 2^3P$ Transitions in Positronium," 1990, with K. Ziock, R. H. Howell, F. Magnotta, and K. Jones, *Journal of Physics B*, **23**, 329.

31. "Narrow, Frequency-Tunable Gamma Radiation," 1990, UCRL-99420.

32. "Stark and Zeeman Effects on Laser Cooling of Positronium," 1990, in *Proceedings of a Workshop on Annihilation in Gases and Galaxies*, ed. R. J. Drachman (NASA Conference Publication, Greenbelt, Maryland), p. 209.

33. "Optically Excited States in Positronium," 1990, with R. H. Howell, K. P. Ziock, F. Magnotta, R. A. Failor, and K. M. Jones, in *Proceedings of a Workshop on Annihilation in Gases and Galaxies*, ed. R. J. Drachman (NASA Conference Publication, Greenbelt, Maryland), p. 201.

34. "The Excess Flux in the Cosmic Submillimeter Background Radiation and the Primordial Deuterium Abundance," 1990, with N. Guessoum, in *Proceedings of the XXIst International Cosmic Ray Conference*, ed. R. J. Protheroe, **3**, 26.

35. "Use of the EGRET Instrument in Studies of the Origin of the Cosmic Radiation: II. Spectral Signatures of Discrete Cosmic Ray Sources," 1990, in *Proceedings of the XXIst International Cosmic Ray Conference*, ed. R. J. Protheroe, **3**, 381.

36. "Thermal Pair Cloud Models of MeV Gamma-Ray Emissions from Cygnus X-1 and the Galactic Center," 1990, with E. P. Liang, in *Proceedings of the XXIst International Cosmic Ray Conference*, ed. R. J. Protheroe, **1**, 125.

37. "Compton Scattering in Strong Magnetic Fields and the Continuum Spectra of Gamma-Ray Bursts: Basic Theory," 1990, *Astrophysical Journal*, **360**, 197.

1991

38. "Luminosity Enhancement Factor for Thermal Comptonization and the Electron Energy Balance," 1991, with E. P. Liang and E. Canfield, *Astrophysical Journal*, **369**, 410.

39. "X-Ray Echoes from Gamma-Ray Bursts," 1991, with K. Hurley and D. Hartmann, *Astrophysical Journal*, **370**, 341.

40. "Resonant Compton Scattering in Models of Gamma-Ray Burst Sources: I. Theory," 1991, with P. Vitello, in the *Los Alamos Workshop on Gamma-Ray Bursts*, ed. C. Ho, R. Epstein, and E. Fenimore, 321.

41. "Resonant Compton Scattering in Models of Gamma-Ray Burst Sources: II. Numerical Modeling," 1991, with P. Vitello, in the *Los Alamos Workshop on Gamma-Ray Bursts*, ed. C. Ho, R. Epstein, and E. Fenimore, 329.

42. "A Theory of Gamma-Ray Bursts Based on Resonant Compton Scattering," 1991, with P. Vitello, *Astrophysical Journal*, **374**, 668.

43. "Pion Production in Strong Magnetic Fields: A Model for Gamma-Ray Emission from Accreting X-Ray Pulsars," 1991, in *Relativistic Hadrons in Cosmic Compact Objects*, ed. A. Zdziarski and M. Sikora (Springer-Verlag: New York), 77.

44. "HEAO 3 Observations of Strong Variable 0.5-3 MeV Emission from the Taurus Region," 1991, with J. C. Ling, in *Gamma-Ray Line Astrophysics*, Paris-Saclay, France, Dec. 10-13 1990, ed. P. Durouchoux and N. Prantzos (AIP: New York), 361.

45. "Effects of Triplet Pair Production on Ultrarelativistic Electrons in a Soft Photon Field," 1991, with R. Schlickeiser, *Astronomy and Astrophysics*, **252**, 414.

46. "X-Rays from Gamma-Ray Bursts," 1991, *Nature*, **350**, 559.

47. "Neutron Stars and the Distance to Gamma-Ray Bursters," with K. Hurley, 1991, *Publications of the Astronomical Society of the Pacific*, **103**, 774-776.

48. "Gamma-Ray Bursts: The Answer is Near," 1991, *Nature*, **351**, 272.

49. "Existence of Scattering Atmospheres near Luminous, Magnetized Compact Objects," 1991, with S. J. Sturner, *Astrophysical Journal Letters*, **382**, L23-L26.

50. "Scattering Atmospheres near Gamma-Ray Burst Sources," 1991, with S. J. Sturner, in *Proceedings of the Huntsville Gamma-Ray Burst Workshop*, ed. W. S. Paciesas and G. J. Fishman, 277-281.

51. "Galactic Neutron Star Model for Gamma-Ray Bursts," 1991, with H. Li, in *Proceedings of the Huntsville Gamma-Ray Burst Workshop*, ed. W. S. Paciesas and G. J. Fishman, AIP COnference Proceedings, **265**115-119.

1992: Compton Era (5 April 1991 – 4 June 2000)

52. "Triplet Pair Production by Ultrarelativistic Electrons in a Soft Photon Field," 1992, with R. Schlickeiser, *Proceedings of the 22nd International Cosmic Ray Conference*, 11-23 August 1993, Dublin, Ireland, 560-563.

53. "Gamma Rays from Extragalactic Radio Sources," 1992, with R. Schlickeiser and A. Mastichiadis, in *Proceedings of the 2nd Gamma Ray Observatory Science Workshop*, ed. C. R. Shrader, N. Gehrels, and B. Dennis, (NASA Technical Memorandum), 328-334.

54. "Statistics of Cosmological Gamma-Ray Bursts," 1992, *Physical Review Letters*, **68**, 1799-1802.

55. "High-Energy Gamma Radiation from Extragalactic Radio Sources," 1992, with R. Schlickeiser and A. Mastichiadis, *Astronomy and Astrophysics Letters*, **256**, L27-L30.

56. "Pulsar Emissions," 1992, with F. C. Michel, *Nature*, **356**, 483-484.

57. "Pair-Compton Cascading in a Spatially-Varying Anisotropic Radiation Field," 1992, with R. J. Protheroe and A. Mastichiadis, *Astroparticle Physics*, **1**, 113-127.

58. "Gamma-Ray Bursts from High-Velocity Neutron Stars," 1992, with H. Li, *Nature*, **359**, 514-516.

59. "Multi-Photon Excitation of Positronium," 1992, with R. H. Howell, K. P. Ziock, F. Magnotta, and R. A. Failor, in *Material Science Forum*, **105-110**, pp. 549-552.

60. "Quasars, Blazars, and Gamma Rays," 1992, with R. Schlickeiser, *Science*, **257**, 1642-1647.

1993

61. "Magnetic Compton Scattering in the Magnetospheres of Radio Pulsars," 1993, with S. J. Sturner and F. C. Michel, in *Proceedings of the Compton Gamma-Ray Observatory Symposium*, eds. N. Gehrels, M. Friedlander, and D. J. Macomb (AIP: New York), p. 284-288.

62. "Gamma Rays from Active Galactic Nuclei," 1993, in *Proceedings of the Compton Gamma-Ray Observatory Symposium*, eds. N. Gehrels, M. Friedlander, and D. J. Macomb (AIP: New York), p. 541-553.

63. "Galactic Halo Model for Gamma-Ray Bursts from High-Velocity Neutron Stars," 1993, with H. Li and E. P. Liang, in *Proceedings of the Compton Gamma-Ray Observatory Symposium*, eds. N. Gehrels, M. Friedlander, and D. J. Macomb (AIP: New York), p. 1035-1039.

64. "Model for the High-Energy Emission from Blazars," 1993, with R. Schlickeiser, *Astrophysical Journal*, **416**, 458-484.

65. "Photon Attenuation from Scattered Radiation in Gamma-Ray Bursts," 1993, with R. Schlickeiser, in *Proceedings of the 23rd International Cosmic Ray Conference*, July 19-30, 1993, Calgary, Canada, p. 156-159.

66. "Location of the Acceleration and Emission Sites in Gamma-Ray Blazars," 1993, with R. Schlickeiser, in *Proceedings of the 23rd International Cosmic Ray Conference*, July 19-30, 1993, Calgary, Canada, p. 160-163.

67. "Observations of Active Galactic Nuclei with the Compton Observatory," 1993, in *Proceedings of the Fifth International Workshop on Neutrino Telescopes*, Venice, Italy, 2-4 March 1993, ed. M. Baldo Ceolin, 427-441.

1994

68. "Particle Acceleration in Extragalactic Jets and Implications for the High-Energy Emission from Blazars," 1994, with R. Schlickeiser, in *IAU Symposium 159, Active Galactic Nuclei across the Electromagnetic Spectrum*, August 30-September 3, 1993, Geneva, Switzerland, ed. T.-J. Courvoisier, 29-32.

69. "Energy-Dependent Effects of Scattering Atmospheres on X-Ray Pulsar Pulse Profiles," 1994, with S. J. Sturner, *Astronomy and Astrophysics*, **284**, 161-173.

70. "On the Location of the Acceleration and Emission Sites in Gamma-Ray Blazars," 1994, with R. Schlickeiser, *Astrophysical Journal Supplements*, **90**, 945-948.

71. "On the Energetics and Number of Gamma-Ray Pulsars," 1994, with S. J. Sturner, *Astrophysical Journal Letters*, **420**, L75-L78.

72. "On the Spectra and Pulse Profiles of Gamma-Ray Pulsars," 1994, with S. J. Sturner, *Astrophysical Journal Letters*, **420**, L79-L82.

73. "Equipartition Plasmas near Accreting Black Holes," 1994, in *Proceedings of the Second Compton Symposium*, eds. C. Fichtel, N. Gehrels, and J. Norris (AIP: New York), 541-545.

74. "A Nearly-Aligned, Polar Cap Gamma-Ray Pulsar Model," 1994, with S. J. Sturner, in *Proceedings of the Second Compton Symposium*, eds. C. E. Fichtel, N. Gehrels, and J. Norris (AIP: New York), 106-110.

75. "Gamma-Ray Emission from Millisecond Pulsars," 1994, with S. J. Sturner, *Astronomy and Astrophysics Letters*, **281**, L101-L104.

76. "Is the High-Energy Emission from Centaurus A Compton-Scattered Jet Radiation?" 1994, with J. G. Skibo and R. L. Kinzer, *Astrophysical Journal Letters*, **426**, L23-L26.

77. "Effects of Scattering Atmospheres on the Pulse Profiles of Accreting X-Ray Pulsars," 1994, with S. J. Sturner, in *The Evolution of X-Ray Binaries*, ed. S. S. Holt & C. S. Day, 495-498.

78. "Gamma-Ray Bursts and Gamma-Ray Blazars," 1994, with R. Schlickeiser, in *The Second Huntsville*

Workshop on Gamma-Ray Bursts, eds. G. J. Fishman, K. Hurley, and J. Brainerd, 510-514.

79. "Compton Scattering in Jets: A Mechanism for ~ 0.4 and $\lesssim 0.2$ MeV Line Production," 1994, with J. G. Skibo and R. Ramaty, *Astrophysical Journal Letters*, **431**, L39-L42.

1995

80. "Magnetic Compton-Induced Pair Cascade Model for Gamma-Ray Pulsars," 1995, with S. J. Sturner and F. C. Michel, *Astrophysical Journal*, **445**, 736-755.
81. "Particle Acceleration and Radiation in the Jets of Active Galactic Nuclei," 1995, in *Proceedings of the Moriond Workshop on Particle Astrophysics, Atomic Physics, and Gravitation*, Villars sur Ollon, Switzerland, January 22-29, 1994, ed. J. Tran Thanh Van, G. Fontaine, & E. Hinds, 47-54.
82. "High-Energy Radiation from Active Galactic Nuclei: Implications for AGN Unification Scenarios," 1995, in *The Gamma Ray Sky with Compton GRO and SIGMA*, Les Houches, France, 25 January - 4 February, 1994, ed. M. Signore, P. Salati, & G. Vedrenne, 39-53.
83. "Association of Unidentified Low Latitude EGRET Sources with Supernova Remnants," 1995, with S. J. Sturner, *Astronomy and Astrophysics*, **293**, L17-L20.
84. "Two Classes of Gamma-Ray Emitting Active Galactic Nuclei," 1995, with N. Gehrels, *Astrophysical Journal*, **447**, 103-120; erratum 1996, **456**, 412.
85. "OSSE Observations of 3C 273," 1995, with W. N. Johnson, R. L. Kinzer, J. D. Kurfess, M. S. Strickman, K. McNaron-Brown, E. Jourdain, G. V. Jung, D. A. Grabelsky, W. R. Purcell, and M. P. Ulmer, *Astrophysical Journal*, **445**, 182-188.
86. "Magnetic Compton Scattering near a Hot Neutron Star Polar Cap," 1995, with S. J. Sturner, *Advances in Space Research* (COSPAR), **15**, 77-80.
87. "Thermal Comptonization in Mildly Relativistic Pair Plasmas," 1995, with J. G. Skibo, R. Ramaty, and J. M. McKinley, *Astrophysical Journal*, **446**, 86-100.
88. "Reverberation Mapping of the Central Regions of Active Galactic Nuclei Using High-Energy γ-ray Observations," 1995, with M. Böttcher, *Astronomy and Astrophysics*, **302**, 32-44.
89. "OSSE Observations of Gamma-Ray Emission from Centaurus A," 1995, with R. L. Kinzer, W. N. Johnson, J. D. Kurfess, M. S. Strickman, J. E. Grove, R. A. Kroeger, D. A. Grabelsky, W. R. Purcell, M. P. Ulmer, G. V. Jung, & K. McNaron-Brown, *Astrophysical Journal*, **449**, 105-118.
90. "OSSE Observations of Blazars," 1995, with K. McNaron-Brown, W. N. Johnson, R. L. Kinzer, J. D. Kurfess, M. S. Strickman, G. V. Jung, D. A. Grabelsky, W. R. Purcell, M. P. Ulmer, M. Kafatos, P. A. Becker, R. Staubert, & M. Maisack, *Astrophysical Journal*, **451**, 575-584.
91. "On the Beaming Statistics of Gamma-Ray Sources," 1995, *Astrophysical Journal Letters*, **446**, L63-L66.
92. "Abundance Enhancements in Black-Hole Accretion: Application to γ-Ray Line Observations of the Orion Complex," 1995, with J. A. Miller, *Astronomy and Astrophysics*, **298**, L13-L16.
93. "Multiwavelength Observations of Mkn 421 During a TeV/X-ray Flare," 1995, with D. Macomb, C. Akerlof, et al., *Astrophysical Journal Letters*, **449**, L99-L103.
94. "Multiwavelength Spectral Modeling of Blazars," 1995, with S. J. Sturner & R. Schlickeiser, in *Proceedings of the XXIV Cosmic Ray Conference*, **2**, 283-286.
95. "Low Energy Cosmic Ray Electrons: Acceleration by Weak Shocks?," 1995, with J. G. Skibo, in *Proceedings of the XXIV Cosmic Ray Conference*, **3**, 82-85.
96. "Reverberation Mapping of the Central Regions of Active Galactic Nuclei Using High-Energy γ-ray Observations," 1995, with M. Böttcher, in *Proceedings of the XXIV Cosmic Ray Conference*, **2**, 579-582.
97. "Method for Organizing the Multiwavelength Data of Radio-Loud Active Galactic Nuclei," 1995, with R. Schlickeiser, *Astronomy and Astrophysics*, **300**, L29-L32.
98. "Cosmological Models of Gamma-Ray Bursts," 1995, with T. J. Weiler, *Astrophysics and Space Science*, **231**, 377-388.
99. "High-Energy Spectral Complexity from Thermal Gradients in Black Hole Atmospheres," 1995, with J.

G. Skibo, *Astrophysical Journal Letters*, **455**, L25-L29.

1996

100. “Statistical Analysis of Gamma-Ray Properties of Rotation-Powered Pulsars,” 1996, with S. J. Sturner, *Astrophysical Journal*, **461**, 872-883.

101. “Gamma-Ray Bursts from Comet-Antimatter Comet Collisions in the Oort Cloud,” 1996, in *Third Huntsville Symposium on Gamma-Ray Bursts*, ed. C. Kouveliotou, M. F. Briggs, and G. J. Fishman (New York: AIP), p. 744-748.

102. “Stochastic Particle Acceleration near Accreting Black Holes,” 1996, with J. A. Miller and H. Li, *Astrophysical Journal*, **456**, 106-118.

103. “Simultaneous Multiwavelength Spectrum and Variability of 3C 279 from 10^9 to 10^{24} Hz,” 1996, with R. C. Hartman *et al.*, *Astrophysical Journal*, **461**, 698-712.

104. “Advanced Telescope for High Energy Nuclear Astrophysics,” 1996, with W. N. Johnson et al., in *S.P.I.E. Conference Proceedings*, **2518**, 74.

105. “Are Supernova Remnants Sources of $>$ 100 MeV γ Rays?,” 1996, with S. J. Sturner and J. R. Mattox, in *Astronomy & Astrophysics Supplement*, **120**, 445-448.

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Brief Description of Research Activities of Dr. Charles D. Dermer

Dr. Dermer has made fundamental theoretical contributions to particle astrophysics and γ-ray astronomy by treating basic physical processes involving high-energy interactions between particles and photons in magnetized plasma. With these studies in hand, he and his colleagues develop numerical simulation models to reproduce the spectral energy distributions (SEDs) of high-energy radiation sources. The most energetic astrophysical γ-ray sources are also the most variable, and patterns in the changing SEDs contain important information. Dr. Dermer tries to fit this data using physical mechanisms that give information about the nature of the sources, such as particle acceleration at shocks, energy loss and radiation by particles, jet formation by black holes, and transport of cosmic rays from their acceleration sites.

The field of gamma-ray astronomy is enjoying a surge of new results with the launch of GLAST, the Gamma ray Large Area Space Telescope, now called the Fermi Gamma ray Space Telescope. In fact, this is a period of amazing growth in the entire field of high-energy astronomy and particle astrophysics, considering that the South Pole IceCube Neutrino Experiment has reached its design sensitivity and has reported the detection of extragalactic neutrinos, the Pierre Auger Observatory of ultra-high energy cosmic rays has had several major data releases showing arrival-direction and shower distributiosn, and the Swift GRB satellite and ground-based γ-ray telescopes sensitive to TeV (10^{12} eV) photons are actively scanning the skies for γ-ray transients. Dr. Dermer, together with his Troy University colleague Professor Govind Menon, wrote a book containing a detailed description of the astrophysics helpful for solving problems arising in high-energy black-hole astrophysics and cosmic-ray astronomy. With the flood of new results coming from a multitude of observatories, Dr. Dermer is poised to make new discoveries in collaboration with the Fermi Team, his NRL group, and international partners.

In preparation for this active period in high-energy astrophysics, several numerical simulation tools have been developed and implemented by Dr. Dermer. Of note, and to be described more fully below, is the (1.) `COSMO` numerical simulation program, a secondary nuclear production model for proton-proton and proton-ion collisions giving accurate secondary energy spectra of baryons, leptons, and photons in proton-proton collisions from threshold to the highest energies. This code, stemming originally from Dr. Dermer's thesis work (#7,8), finds applications in the interpretation of data from Solar flares, supernovae, the Milky Way, clusters of galaxies, and the Earth's atmospheric γ-ray glow. Other major accomplishments include (2.) a relativistic jet model, where the accelerated particles in the jet scatter ambient radiation in the environment of the massive central black hole, that also calculates high-energy neutrino and γ-ray production made through photo-hadronic interactions of energetic protons and ions in jet sources; (3.) contributions to the theory of cosmic-ray origin at $\sim$GeV – PeV ($10^9 - 10^{15}$ eV) and >EeV (10^{18} eV) energies, and (4.) a research initiative to calculate the background light from stars, galaxies, and black holes.

The capabilities of the Space Radiations Section led by Dr. Dermer are broader still, encompassing a major spallation interaction code for the production of γ-ray lines from the decay of excited nuclei made in the collisions or protons, α particles, and ions; a Monte Carlo program to calculate the Compton-scattered spectra of photons as they pass through hot and even relativistic thermal plasmas with temperature gradients; and finite differencing and Monte Carlo simulation programs to model the SEDs of sources of MeV and GeV radiation formed by magnetized plasma moving towards us almost at the speed of light.

As new observations with Fermi are made, analysis tools that Dr. Dermer and his colleagues have developed are being employed to explain unusual events in the sky, such as gamma-ray bursts (GRBs) so bright and distant that they apparently emit more energy than does the universe during the time of the GRB, or the SEDs of blazars, which are supermassive black holes with masses typically of $\approx 10^9$ Solar masses, that eject highly energetic plasma jets that are aligned, by chance, in our direction. These techniques and tools have been developed over nearly a quarter century, a period culminating with the launch and success of the Fermi Telescope.

Fundamental Particle and Nuclear Interactions

Some of Dr. Dermer's most important contributions in physics have been fundamental studies of particle-collision processes in high-energy astrophysics. One of the most elementary particle processes, which at the same time is of primary importance in γ-ray astronomy, is the interaction between a high-energy proton and a proton at rest. Above the pion production threshold at ≈ 300 MeV, secondaries are formed and decay to make γ rays and energetic electrons and positrons. The γ-ray secondaries, and those made by the electrons and positrons, form the diffuse γ-ray glow of the Milky Way galaxy. At least this is what was claimed in 1972, at the time of the report of the discovery of 621 γ-ray events towards the plane of the Milky Way.

By the time of Dr. Dermer's thesis, in 1984, it was generally accepted that cosmic rays make the Galactic γ-ray glow, but methods to calculate the γ-ray spectrum were in dispute. Dr. Dermer resolved this controversy by proposing to use scaling representations at energies well above threshold, as originally suggested by Richard Feynman, and calculations of baryon resonance excitations, particularly the Δ^+ resonance, for interactions near threshold. The transition between the low-energy exclusive treatment to the high-energy inclusive treatments was based on a detailed comparison of the predictions of the particle physics models with experimental cross sections in the GeV regime. The two papers (#7,8) by Dr. Dermer outlining this method have received nearly 400 citations.

The `COSMO` code sprang from the need to calculate the diffuse glow of the γ-ray light made by cosmic-ray interactions with gas and dust in the plane of the Milky Way, and was used in the EGRET days to calculate γ-ray production from the supernova remnants of exploding stars (#117). But it had an earlier use to model the unexpected γ-ray emission recently detected above 100 MeV from Solar flares with the Solar Maximum Mission in the mid-1980s. This motivated the creation of a detailed Solar flare code using pion-production that is found in a paper (#12, with more than 150 citations) by Dr. Dermer, with Dr. Reuven Ramaty and Ronald J. Murphy (both then at the NASA Goddard Space Flight Center), that has become a standard reference for Solar γ-ray emisison.

Since then, the `COSMO` code has been upgraded to calculate secondary production spectra of electrons, positrons, γ rays and neutrinos. A detailed paper (#187) reporting calculations of the γ-ray emission from shocks formed in merging clusters of galaxies with the `COSMO` code made by Dr. Dermer in association with Dr. Robert Berrington, then an NRC postdoctoral associate with Dr. Dermer, even though γ-ray emission has not been discovered—even with Fermi—from clusters of galaxies.

The `COSMO` code is now being adapted to model Fermi observations of the γ-ray glow of the Milky Way and the spectral maps of supernova remnants over wide energy ranges. The new capability being built into this code is to follow particles while they lose energy and diffuse away from the acceleration region. The first maps of supernova remnants at GeV energies made with data from Fermi were just reported, and the first TeV maps of supernova remnants and Galactic γ-ray sources date back only to 2006. Analysis and modeling of the γ-ray data with the `COSMO` code presents Dr. Dermer and his group the best chance to establish the sources of cosmic rays using the new information from Fermi.

Relativistic Jet Physics

Prior to the launch of the Compton Gamma Ray Observatory (CGRO) in 1991, there was only one extragalactic source of high-energy γ rays known, the quasar 3C 273. This object, which was one of the first sources discovered at high redshifts by Professor Maarten Schmidt of the California Institute of Technology, exhibits bright UV radiation thought to be made by matter accreting onto a supermassive black hole. But being radio-luminous, 3C 273 also has outflowing plasma jets characteristic of radio galaxies. There was great uncertainty about the origin or reality of the high-energy radiation until the Energetic Gamma Ray Experiment Telescope (EGRET) on CGRO spotted a γ-ray bright source, 3C279, near 3C 273, but did not detect 3C 273 itself until later in the CGRO mission.

Like 3C 273, 3C 279 is also radio-loud and a radio-emitting jet source. Shortly after the announcement of this discovery by the EGRET team, Dr. Dermer and his colleagues Dr. Reinhard Schlickeiser (Max-Planck-Institut für Radioastonomie in Bonn; now professor at Bochum University, Germany) and Dr. Apostolos Mastichiadis (Max-Planck-Insitut für Kernphysik in Heidelberg; now professor at the University of Athens) proposed in 1991 that the γ rays from 3C 279 were made by radio-emitting electrons that scatter photons from outside the jet. This so-called external Compton scattering model has become the standard explanation for the origin of γ-rays, and makes predictions for a multitude of effects, including correlations between the radio and γ rays and different beaming factors of the various radiations, an effect discovered (#91) by Dr. Dermer. These factors are required to perform accurate studies of the statistics of γ-ray emitting galaxies, which reveal black-hole growth, fueling, and dimming. The paper (#55) by Drs. Dermer, Schlickeiser, and Mastichiadis proposing external Compton scattering process has received more than 370 citations and a more detailed paper (#64) exploring the physics of this mechanism has received over 500 citations. The paper by Dr. Dermer on beaming factors has received more than 185 citations.

Relativistic jet physics for blazar galaxies that exhibit strong, variable, and highly polarized radio, optical, and γ radiation is an important subject in high-energy astronomy More than 600 such blazars have been detected with Fermi in data from its first eleven months, which is a factor $10\times$ more blazars than known in the EGRET/CGRO days. Dr. Dermer has helped write numerous active galaxy papers with the Fermi team and, in collaboration with Dr. Justin Finke of NRL, has developed state-of-the-art modeling codes that are integral to the analysis of γ-ray and multiwavelength emission from blazars and radio galaxies. The unusual SEDs and rapid variability, at times showing strong flux variations in less than a few hours, point to a black-hole engine. The codes developed to reproduce the SEDs of blazars imply the magnetic field and the speed of the emitting plasma and the power of the jet, from which important restrictions on the energy source of black-hole jets can be made. The reservoir of rotational energy carried by the black hole adds to the accretion power from the dark star.

Over the last 14 years, Dr. Dermer in collaboration with Dr. Markus Böttcher (now professor at Northwest University in South Africa, have been considering cosmic-ray hadron as well as more standard nonthermal electron models. Dermer and Böttcher made the first detailed calculations of ultra-high energy cosmic-ray interactions and accompanying γ-ray fluxes from GRBs (#129). With IceCube and Fermi, we are in a position to test these predictions. In more detailed calculations with Dr. Armen Atoyan (Université de Montréal, now professor at Concordia University, Montréal) published in Physical Review Letters (#169,185), neutrino production from blazars was found to depend strongly on the scattered radiation made in the environments of luminous black holes, or the supernova remnant shell emissions in some models of GRBs. The idea that black-hole blazar and GRB jets are sources of beamed neutral particles, including neutrons, neutrinos, and γ photons, is worked out in a series of papers (#183,213) by Atoyan and Dermer.

Dr. Dermer has also been active in GRB research. Following the Compton CGRO era, Dr. Dermer worked with Ms. Magda González and Professor Brenda Dingus, both then affiliated with the University of Wisconsin and Los Alamos National Laboratory. This resulted in a 2003 Nature paper (#186) that demonstrated the existence of separate hard spectral components in GRBs, and the discovery has been confirmed repeatedly with the Fermi Telescope.

Black-hole Physics and Astrophysics

The physics of the energy production and transport is needed to understand the enormous energy releases in black holes, which have in principle three energy reservoirs. If very light ($\lesssim 10^{18}$ gm for evaporation on timescales shorter than the age of the universe), black holes can evaporate by Hawking radiation, for which there is yet no evidence. Matter can accrete onto black holes and heat up to UV and X-ray temperatures, and this process is universally accepted to explain the UV radiations in galaxies with active nuclei. Finally, energy contained in the black-hole rotation can be extracted through electrodynamical processes. The latter process is dealt with in several papers and the book by Dr. Dermer and Professor Menon.

Building on the ideas by Penrose and Blandford and Znajek, Professor Govind Menon, while visiting NRL as a summer faculty in 2005, worked with Dr. Dermer to solve the constraint equation for a force-free magnetic field around a rotating black hole. Their solution (#205,214) generalizes the Blandford/Znajek split monopole solution to all values of a, the spin parameter of the black hole. The jet problem is not yet solved, as this solution has the largest energy flux along the equator.

In other black-hole research, Dr. Dermer and colleagues have used the observed statistical and spectral properties of black-hole events to model evolution of blazar black holes (#170) and the rates of black-hole formation (as revealed by GRBs) (#217) through cosmic time. This probes the question whether black-hole spin triggers jet formation. This line of enquiry also tries to explain the stark differences between radio-loud black holes with extended radio jets, which can also be exceedingly γ-ray loud, and radio-quiet black holes with bright UV emission, which have not yet been detected in GeV γ rays (#51). Black holes as the sources of the energy of γ rays and ultra-high energy cosmic rays is the main themes of the book "High Energy Radiation from Black Holes."

Cosmic-Ray Origin Studies

One of the great unsolved problems in astronomy and physics is the origin of the cosmic rays, ultra-relativistic charged particles diffusing throughout the Milky Way and into our Solar cavity, which were discovered in 1912 by Victor Hess, for which he won the 1936 Nobel Prize. There are other parts to this story, however. One concern is from cosmic rays impacting spacecraft and making event upsets in computers or defects in materials, and another is cosmic rays making radiation effects on humans not shielded artificially or by the Earth's magnetosphere or atmosphere. A third concern is cosmic-ray flux increases due to nearby supernovae or GRBs that took place earlier in the Galaxy.

The intensity of the cosmic rays, as is well known, is modulated by the strength and activity of the Sun and its outgoing solar wind, so that the intensity of cosmic rays near 1 GeV correlates inversely with the 11-yr sunspot (half the solar) cycle. Because the intensity of $\sim$ GeV cosmic rays in the interstellar medium differs by an uncertain amount from the measured cosmic-ray flux in the near-Earth space environment, γ-ray measurements through the plane of the Galaxy can reveal the low-energy part of the cosmic ray spectrum. Remarkably, the underlying assumption that the cosmic-ray spectrum throughout the Galaxy is the same as measured locally, seems to be true. Dr. Dermer's latest attempt to determine the interstellar cosmic-ray spectrum based on this idea was recently published in the Physical Review Letters (#12_13)

This does not tell us what the sources of the cosmic rays are, which is the root science question. It is generally believed that they are accelerated at the shocks in the remnants of supernova explosions, and this seems to be what the Fermi and ground-based γ-ray telescope data are showing. But supernova remnants are not all the same: the young, ~ 3000 yrs, are TeV bright, and the middle-aged, $\sim 30,000$ yrs are GeV bright (#168,187,191). Drs. Dermer and Finke are now applying the `COSMO` code to try to model the evolution from a lepton-dominated young remnant to a proton dominated middle-aged remnant. Working with SEAP student, Ms. Gauri Powale, now a student at UC Berkeley, trends in the luminosities and relative brightnesses at GeV and TeV energies were extracted from the Fermi data (#13_4). Dr. Dermer, as part of the Fermi Large Area Telescope (LAT) Collaboration provided solid evidence that the supernova remnants IC 443 and W44 are source of cosmic rays by identifying the pion bump feature, made by cosmic rays interacting with ambient matter, in the SEDs of these remnants #129F.

Of equal or even more fascinating interest is the problem of the origin of the ultra-high energy cosmic rays

(UHECRs), which can be so energetic that a single nucleus may contain macroscopic (Joules of) energy. Since they are also rare, however, they represent only a slight addition to the measured cosmic-ray particle energy flux. Not being contained by the Milky Way's magnetic field, UHECRs are certainly of extragalactic origin. Probing outside the Galaxy, we can look for sources by tracing back the arrival directions of the highest energy cosmic rays to their sources. But the original claim for ultra-high energy clustering has been weakened with the addition of new data from the Pierre Auger collaboration. As theorists, Dr. Dermer and Prof. Menon postulate in their book that only jetted black-hole engines have the conditions favorable to accelerate particles to the highest energies, and those are found in two classes of objects: the highly relativistic jets of GRBs made while forming a Solar-mass black hole, and the persistent and intermittent plasma flows of blazars with supermassive, $\approx 10^9$ Solar-mass black holes. Other scenarios would conflict with these claims, such as those where the highest energy cosmic rays are accelerated by young, highly magnetized neutron-star models or formed as secondaries in the decay of exotic particles. With the large number of experiments in operation, these ideas will be tested, and the solution to the problem of cosmic-ray origin may soon be answered.

Modeling the Background Light

Even before Olbers thought deeply about it, people have surely asked whether the nighttime sky glows, as it does in the plane of the Milky Way, because of the summed emissions from many unseen faint objects. Olbers himself asked if space is infinite, why is the sky not infinitely bright?

We know that time isn't infinite, and that we live in an accelerating flat universe with cosmological dark energy making $\approx 73\%$ of the energy density of the universe, with the remaining $\approx 27\%$ composed of matter, of which only $\approx 3\%$ is normal matter that we "understand," the remainder being dark matter. This 3% makes the infrared, optical, X-ray, and γ-ray background radiation that functions as an inescapable cosmic glow. The major part of the radiation background, in terms of energy density, is the cosmic microwave background, which is the thermal remnant of the universe's hot early phase on which is encoded acoustic messages about its formation. At infrared and shorter wavelengths, stellar emissions over the age of the universe make the dominant contribution to the background glow. By summing up the light of stars during their lifetimes, and taking into account dust absorption and re-radiation, Dr. Dermer, with NRL postdoctoral associates Dr. Justin Finke (now a federal NRL scientist in the Space Radiations Section) and Dr. Soebur Razzaque (now professor at the University of Johannesburg, South Africa), recently made predictions (#9_1,10_3; the latter 2010 paper has already garnered over 150 citations) about the intensity of infrared and optical radiation background. The level of the background optical light can be tested using γ-ray observations from sources so distant that their multi-GeV radiation is attenuated by electron-positron pair-forming collisions with the optical photons. This $\gamma\gamma \to e^+e^-$ process also allows Dermer and his colleagues to infer the intensity of the infrared radiation from low-redshift TeV blazars.

Of related interest is the explanation for the MeV – GeV – TeV background radiation intensity. Prior to Fermi, it was generally thought that blazar emissions would make the dominant part of the γ-ray background. Dr. Dermer made calculations (#215) using a physical jet model for the EGRET blazar data that was published in the year prior to the GLAST launch, and found that the total blazar emission would only amount to $\approx 20\%$ of the claimed EGRET background. The lower flux of the diffuse extragalactic γ-ray background measured by the Fermi collaboration (see also #12_11) roughly confirms the analysis by Dr. Dermer, and leaves open a large number of possible ways to make the γ-ray emission not explained by blazars, including dark matter annihilation, emission from structure formation shocks, and γ rays emitted from the radio lobes of radio galaxies. Dr. Dermer thinks that the the summed glow of the dim multitude of star-forming galaxies like our Milky Way is the likely explanation, and participated on the Fermi Large Area Telescope (LAT) discovery of weak GeV emission from the starburst galaxies M82 and NGC 253, which are making stars at a rate $\approx 10\times$ greater than that of the Milky Way. The many Fermi Team papers of which Dr. Dermer is a co-author are listed separately in the preceding bibliography.

Summary

In the course of developing analytical and simulation tools described above, many new and interesting physical effects have been discovered in research led by Dr. Dermer. For example, Dr. Dermer, working with Dr. Armen Atoyan, found that cooling effects due the onset of the Klein-Nishina decline in Compton scattering make a hardening of the radiating electron spectrum that can be detected as a hardening in the radio/X-ray spectrum of radio galaxies. The paper (#172) reporting this effect has received over 60 citations and has been applied to explain the hardening in the cosmic-ray electron spectrum reported by the Fermi Collaboration in a paper that has received over 700 citations. Several others effects were mentioned in the text above.

Dr. Dermer maintains an active research schedule, and gives many presentations, seminars, and colloquia each year. In March 2010, Dr. Dermer was one of 3 lecturers at the annual Saas-Fee school in Switzerland, where he presented 9 lectures on the Fermi Gamma ray Space Telescope results. The write-up of this lecture series appeared as one of three chapters in a book entitled "Astrophysics at Very-High Energies." Two years earlier he was a visiting professor at the La Plata, Argentina, International School on Astronomy and

Geophysics, where he delivered 5 lectures on gamma-ray bursts, with notes to the lectures published by the Asociación Argentina de Astronomía. He has taught twice at the Fermi Gamma-ray Space Telescope summer schools in Lewes, Delaware. While at NRL, Dr. Dermer has supervised 9 postdoctoral research associates, 4 DoD SEAP students, a college student, and 3 ASEE summer faculty researchers, while hosting numerous visitors. He has participated in numerous NASA review panels, NSF proposal evaluations, external review committees, and scientific organizing committees.

Reports

- *High Energy Neutrino Observatories* Report by the High Energy Neutrino Astrophysics Panel to the Particle and Nuclear Astrophysics and Gravitation International Committee of the International Union of Pure and Applied Physics, 1 July, 2002.

  Dr. Dermer was one of a small group of top particle physicists and astrophysicists asked to prepare a report describing ongoing efforts to detect neutrinos of cosmic origin, and to consider prospects for developing a deep underwater, Northern Hemisphere neutrino detector, probably in the Mediterranean Sea.

- NASA *Beyond Einstein: from the Big Bang to the Black Hole*, Roadmap of the Structure and Evolution of the Universe Subcommittee, January, 2003.

  This document was prepared by a NASA advisory committee of US space scientists on which Dr. Dermer served from 2001 – 2004. It laid out the strategy favored by a large part of the US space science community to advance our knowledge about the structure and evolution of the universe in the coming years. High priority science advocated were a space-based gravitational wave detector, and a high-sensitivity X-ray telescope, and GLAST.

The covers of these reports are reproduced in Figs. 3 and 4. Dr. Dermer has also helped write many white papers related to the development and justification of high-energy astronomical instrumentation.

HENAP REPORT 1-July-2002

High Energy Neutrino Observatories

(HENAP Report to PaNAGIC)

The High Energy Neutrino Astrophysics Panel

Enrique FERNANDEZ (Spain) Chair, Steve BARWICK (US), John CARR (France), Charles DERMER (US), Friedrich DYDAK (CERN), Grigorij DOMOGATSKY (Russia), Emilio MIGNECO (Italy), Rene ONG (US), John PEOPLES (US), Leonidas RESVANIS (Greece), Yoji TOTSUKA (Japan), Eli WAXMAN (Israel).

Figure 3: Cover for High Energy Neutrino Observatories report.

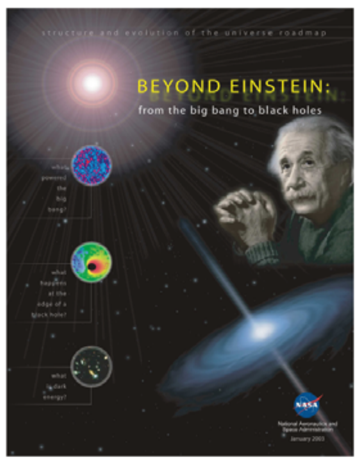

Figure 4: Cover for Beyond Einstein Roadmap.