CURRICULUM VITAE

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B.S.: University of Notre Dame, Physics (June 1963)
Ph.D.: University of Maryland, 1963–1967, Physics (August 1967).
Title of Ph.D. Dissertation: "Almost Symmetric Spaces and Gravitational Radiation"

Experience:

a. National Science Foundation Pre-doctoral Fellow, University of Maryland, 1963–1967.

b. Physicist (GS 7), Naval Research Laboratory, Washington, D.C., Summer 1964.

c. Graduate Research Assistant, University of Maryland, 1964–1966.

d. National Science Foundation Faculty Associate, The University of Texas at Austin, 1967–1969.

e. Assistant Professor, The University of Texas at Austin, 1969–1973.

f. Visiting Research Fellow, Wesleyan University, 1969–1970.

g. Member of expeditionary team to Mauritania, June-July 1973.

h. Associate Professor, The University of Texas at Austin, 1973–1980.

i. Stanford-NASA ASEE Summer Research Fellow, Summer 1977, 1978.

j. PROFESSOR OF PHYSICS, The University of Texas at Austin, September 1980–

k. Visiting Professor, Astrophysics Department, Oxford University, 1981–1982.

l. DIRECTOR, CENTER FOR RELATIVITY, University of Texas at Austin, 1987–

m. Visiting Professor, Insituto de Fisica dello Spazio Interplanetario (CNR/ASI), July 1991.

n. Lead Principal Investigator, The Binary Black Hole Grand Challenge Alliance, 1993–1999

o. Orson Anderson Scholar, Los Alamos National Laboratory, September 1996–May 1997.

p. Faculty Associate, Institute for Geophysics and Planetary Physics, Los Alamos National Laboratory, 1997–

q. Sponsored Consultant, Chicago ASCI Center for Astrophysical Flashes (1999, 2000).

r. UCLA Software Management Project Course (December 2001)

Member of Professional Societies:

Fellow[1], American Physical Society
Foreign member, Accademia delle Scienze di Torino (Academy of Sciences of Turin)
American Association for Advancement of Science
International Astronomical Union
International Society on General Relativity and Gravitation
(Member, Nominating Committee, 1989–1995; Auditor, 2001–)
American Geophysical Union
American Astronomical Society

National/International Committee Service:

National Research Council Air Force Studies Board Committee on Accuracy of Time Transfer in Satellite Systems, July 1984–July 1986.

Subcommittee of Oversight Review Committee for the National Science Foundation Gravitational Physics Program, January 1988– .

National Aeronautics and Space Administration Science Coordinating Committee for Experimental Gravitation, September 1988– .

National Research Council Astronomy and Astrophysics Survey Computing and Data Processing Panel, June 1989–1991.

Co-organizer (with J. York and T. Piran), Aspen Workshop on Relativity, Summer 1990.

NRC/NAS/NSF Graduate Fellowship Program Evaluation Panel, 1991, 1993.

San Diego Supercomputer Center/NPACI Allocation Committee, 1992–1999.

San Diego Supercomputer Center/NSF Grand Challenge (MetaCenter) Computer Allocation Committee, 1993–1999.

National Aeronautics and Space Administration Ultraviolet/Visible and Gravitation Astrophysics Branch Program Review Panel, 1993.

National Science Foundation Physics Subcommittee of the Advisory Committee for Mathematical and Physical Sciences, 1993– .

National Science Foundation Physics Division Director Recruitment Committee, 1994.

European Space Agency LISA Theory Working Group, 1994– .

Member, Editorial Board, *Computers in Physics*, 1988–1991.

Member, Advisory Committee, *Computers in Physics*, 1992–1995.

Member, International Advisory Committee, International Conference on Gravitational Waves: Sources and Detections (Pisa, Italy, March 19-23, 1996).

Member, Organizing Committee, 15th International Conference on Gravitation and General Relativity (Pune, India, 1997).

Member, Scientific Advisory Board (Fachbeirat) at the Max-Plank-Institut für Gravitationsphysik (Potsdam, Germany, 1996–2006); Member of the subcommittee on the GEO600 gravitational wave detector at Hannover, Germany (2003–2006).

Science Advisor and Member of Review Committee for Earth & Sky[2] 1997– .

Los Alamos Institute for Geophysics and Planetary Physics External Advisory Committee, 1997.

Integration/Partnership Working Group Member, DOE/NSF Workshop on Advanced Scientific Computation (National Academy of Sciences, Washington, DC, July 30-31, 1998).

[1]Citation: "For his analysis in general relativity of a wide range of astrophysical phenomena, especially his numerical simulations of strong-field gravitational systems and the gravitational radiation they produce."

[2]Earth & Sky is a daily radio program produced by Byrd & Block Communications, Inc. of Austin, Texas, with major funding from the National Science Foundation's Informal Science Education program. The show is heard on over 950 commercial and public radio stations and their translators in the United States.

Member, LARES (Laser Relativity Satellite) Italian Space Agency Phase A Study Team (1998).

Member, Scientific Organizing Committee, SIGRAV Graduate School in Contemporary Relativity and Gravitational Physics, Centro di Cultura "A. Volta," Villa Olmo, Como (Italy, 1998–).

CHAIRMAN, Department of Energy Review Team, Chicago ASCI Center on Astrophysical Flashes (University of Chicago, October 19-20, 1998).

Lead Judge (one of six), Siemens Westinghouse Science and Technology Competition, 1999–2004.

Member, Local Organizing Committee, 20th Texas Symposium on Relativistic Astrophysics (Austin, TX, Dec 2000).

Member, LIGO Program Advisory Committee, 2001– . CHAIRMAN 2003– .

Member, Internal Review Committee, NASA–Ames/Stanford University, Center for Turbulence Research, 2001– .

Member, Internal Review Committee, Astrophysics Division, Goddard Space Flight Center, 2003– .

Member, Editorial Advisory Board, American Journal of Physics, 2004– .

Member, Department of Energy Review Committee on High Performance Computing at Oak Ridge National Laboratory, 2004.

Member, Department of Energy Leadership Class Computing Capability for Science Review, Washington D.C. 2004.

Honors:

Honorable Mention (with J. Barrow), Gravity Essay Competition, 1977.

First Prize (shared), Fall 1978 McDonald Observatory News Popular Science Writing Contest.

Honorable Mention, Gravity Essay Competition, 1980.

Honorable Mention (with B. Tolman), Gravity Essay Competition, 1982.

University Medal, Helsinki University, March 15, 1982.

University Silver Medal, Universidad Nacional Autonoma de Mexico, awarded December 4, 1990, Cocoyoc, Mexico.

Publications and Papers in Preparation:
*Items marked with an asterisk appear in refereed journals.

*1. "Gravitational Field Equations for Sources with Axial Symmetry and Angular Momentum" (Richard A. Matzner and Charles W. Misner), *Physical Review* **154**, 1229 (February 1967).

*2. "Scattering of Massless Scalar Waves by a Schwarzschild 'Singularity' " (Richard A. Matzner), *Journal of Mathematical Physics* **9**, 163 (January 1968).

*3. "3-Sphere 'Backgrounds' for the Space Sections of the Taub Cosmological Solution" (Richard A. Matzner), *Journal of Mathematical Physics* **9**, 1063 (July 1968).

*4. "Almost Symmetric Spaces and Gravitational Radiation" (Richard A. Matzner), *Journal of Mathematical Physics* **9**, 1657 (October 1968).

*5. "On the Present Temperature of Primordial Black-Body Gravitational Radiation" (Richard A. Matzner), *The Astrophysical Journal* **154**, 1123 (October 1968).

*6. "The Evolution of Anisotropy in Non-Rotating Bianchi Type V Cosmologies" (Richard A. Matzner), *The Astrophysical Journal* **157**, 1085 (September 1969).

*7. "Effect of Various Cross Section Energy Dependences in Calculations of Cosmological Viscosity" (Richard A. Matzner), *Astrophysics and Space Sciences* **4**, 459 (February 1969).

*8. "Dynamics of $SO(3,R)$-Homogeneous Cosmologies" (Richard A. Matzner, L. C. Shepley and James B. Warren), *Ann. Phys.* **57**, 401 (April 1970).

*9. "Rotation in Closed Perfect-Fluid Cosmologies" (Richard A. Matzner), *Journal of Mathematical Physics* **11**, 2432 (August 1970).

*10. "Collisionless Radiation in Closed Cosmologies" (Richard A. Matzner), *Comm. Math. Phys.* **20**, 1 (January 1971).

*11. "Closed Rotating Cosmologies Containing Matter Described by the Kinetic Theory. A: Formalism " (Richard A. Matzner), *Ann. Phys.* (NY) **65**, 438 (June 1971).

*12. "Closed Rotating Cosmologies Containing Matter Described by the Kinetic Theory. B: Small Anisotropy Calculations; Application to Observation" (Richard A. Matzner), *Ann. Phys.* (NY) **65**, 482 (June 1971).

*13. "On Stationary Axisymmetric Solutions of the Einstein Field Equations" (Richard A. Matzner and Yavuz Nutku), *The Astrophysical Journal* **167**, 149 (July 1971).

*14. "Rotation Does Not Enhance Mixing in the Mixmaster Universe" (Richard A. Matzner and D. M. Chitre), *Comm. Math. Phys.* **22**, 173 (July 1971).

*15. "Perturbations in Anisotropic Euclidean-Homogeneous Cosmologies" (T. E. Perko, Richard A. Matzner, and L. C. Shepley), *Phys. Lett.* **A35**, 467 (July 1971).

*16. "Dissipative Effects in the Expansion of the Universe I" (Richard A. Matzner and Charles W. Misner), *The Astrophysical Journal* **171**, 415 (February 1972).

*17. "Dissipative Effects in the Expansion of the Universe II. A Multicomponents Model for Neutrino Dissipation of Anisotropy in the Early Universe" (Richard A. Matzner), *The Astrophysical Journal* **171**, 433 (February 1972).

*18. "Closed Rotating Cosmologies Containing Matter Described by the Kinetic Theory. Entropy Production in the Collision Time Approximation" (Richard A. Matzner), *Journal of Mathematical Physics* **13**, 7 (July 1972).

*19. "Galaxy Formation in Anisotropic Cosmologies" (T. E. Perko, R. A. Matzner and L. C. Shepley), *Physical Review D*, Third Series **6**, 969 (August 1972).

*20. "A Model for Peaking of Galactic Gravitational Radiation" (Richard A. Matzner and G. Campbell), *Journal of Mathematical Physics* **14**, 1 (January 1973).

*21. "Ejection of Matter and Gravitational Radiation from Orbiting Bodies" (A. A. Jackson and Richard A. Matzner), *Nature* **241**, 112 (February 1973).

*22. "The Brans-Dicke Theory and Anisotropic Cosmologies" (R. A. Matzner, M. P. Ryan, Jr., and E. T. Toton), *Il Nuovo Cimento* **14B**, 161 (April 1973).

*23. "Numerical Solutions for Symmetric Bianchi Type IX Universes" (Allan R. Moser, Richard A. Matzner and Michael P. Ryan, Jr.), *Ann. Phys.* **79**, 558 (August 1973).

*24. "On the Method of Virtual Quanta and Gravitational Radiation" (R. A. Matzner and Y. Nutku), *Proc. Roy. Soc.* **A336**, 285 (January 1974).

*25. "Photographic Experiments in Preparation for a Test of General Relativity During the Eclipse of 30 June 1973" (Richard A. Matzner and M. P. Ryan, Jr.), American Astronomical Society *Photobulletin* **1**, 10 (1975).

26. "Modern Theoretical and Observational Cosmology" (Thomas B. Chriss, Richard A. Matzner, Michael P. Ryan, Jr. and L. C. Shepley), *General Relativity and Gravitation,* Proceedings of the Seventh International Conference on Gravitation and General Relativity (1975).

*27. "Gravitational Deflection of Light. Solar Eclipse of 30 June 1973, I. Description of Procedures and Final Results" (Texas Mauritanian Eclipse Team.[3] Seventeen authors, including Richard Matzner), *Astronomical Journal* **81**, 452 (June 1976).

*28. "Zero-Mass Plane Waves in Non-Zero Gravitational Backgrounds" (Paul L. Chrzanowski, Richard A. Matzner, Vernon D. Sandberg, Michael P. Ryan, Jr.), *Physical Review D* **14**, 317 (July 15, 1976).

*29. "Low Frequency Limit Conversion Cross Sections for Charged Black Holes" (Richard A. Matzner), *Physical Review D* **14**, 3274 (December 15, 1976).

*30. "Pair Production by Gravitational Waves in the Field of a Black Hole" (Richard A. Matzner and Y. Nutku), *Phys. Lett.* **A60**, 1 (January 1977).

*31. "Low Frequency Limit of Gravitational Scattering" (Richard A. Matzner and Michael P. Ryan, Jr.), *Physical Review D* **16**, 1636 (September 1977).

*32. "Gravitationally Induced Electromagnetic Bremsstrahlung" (Richard A. Matzner and Vernon D. Sandberg), *Physical Review D* **16**, 2939 (November 15, 1977).

*33. "The Homogeneity and Isotropy of the Universe" (J. D. Barrow and Richard A. Matzner), *Monthly Notices of the Royal Astronomical Society* **181**, 719 (December 1977).

*34. "Scattering of Gravitational Radiation from Vacuum Black Holes" (Richard A. Matzner and Michael P. Ryan, Jr.), *The Astrophysical Journal Suppl.* **36**, 451 (March 1978).

[3]The author's name for this paper appeared precisely as "Texas Mauritanian Eclipse Team."

*35. “The Method of Virtual Quanta as a Probe of the Equivalence Principle” (Richard A. Matzner), *GRG Journal* **9**, 71 (1978).

*36. “Photographic Astrometry Against a Bright Sky: Theory and Application” (F. A. Handler and Richard A. Matzner), *The Astrophysical Journal* **83**, 1227 (October 1978).

*37. “Plane-Symmetric Cosmologies” (Joan Centrella and Richard A. Matzner), *The Astrophysical Journal* **230**, 311 (June 1979).

*38. “Instability of the Cauchy Horizon of Reissner-Nordström Black Holes” (Richard A. Matzner, Nelson Zamorano and Vernon D. Sandberg), *Physical Review D* **19**, 2821 (1979).

*39. “Imaginary-Frequency Interior Modes of Black Holes” (Richard A. Matzner and Nelson Zamorano), *Proc. Roy. Soc.* **A273**, 223 (1980).

*40. “On Observations of the Cosmic Radiation Background” (Richard A. Matzner), *The Astrophysical Journal* **241**, 851 (1980).

*41. “The Size of a Bouncing Mixmaster Universe” (John Barrow and Richard A. Matzner), *Physical Review D* **21**, 336 (January 15, 1980).

42. *Gravitational Radiation and the Equivalence Principle by the Technique of Virtual Quanta,* published by the Dublin Institute of Advanced Studies, 1980. (Notes on Lectures given at DIAS, Summer 1979).

*43. “Gravitational/Electromagnetic Conversion Scattering on Fixed Charges in the Born Approximation” (R. A. Breuer, M. Rosenbaum, M. P. Ryan, Jr., and R. A. Matzner), *Physical Review D* **23**, 305 (1981).

*44. “Upper Limits on Micro-Mini Black Holes” (T. Rothman and R. A. Matzner), *Astrophysics and Space Sciences* **75**, 229 (1981).

*45. “Gravitational Wave Scattering” (F. A. Handler and R. A. Matzner), *Physical Review D* **22**, 2331 (1980).

*46. “Gravitational Deflection of Light in the 1-1/2 PPN Approximation” (R. A. Matzner and G. Richter), *Astrophysics and Space Sciences* **79**, 119 (1981).

47. “General Relativity in Astrophysics” (Proceedings of a workshop chaired by R. Matzner, at the Tenth Texas Symposium on Relativistic Astrophysics, Baltimore, 1980. Proceedings of Conference, New York Academy of Sciences, 1981).

*48. “Electromagnetic Wave Scattering by Spheroidal Objects Using a Method of Spin-Weighted Harmonics” (John A. H. Futterman and Richard A. Matzner), *Radio Science* **16**, 1303 (1981).

*49. “Colliding Gravitational Waves in Expanding Cosmologies” (Joan A. Centrella and Richard A. Matzner), *Physical Review D* **25**, 930 (1982).

*50. “Electromagnetic Wave Scattering by Spheroidal Conductors for Arbitrary Polarization and Angle of Incidence. I. Theory” (John A. H. Futterman and Richard A. Matzner), *Radio Science* **17**, 463 (1982).

*51. “Scale-Covariant Gravitation and Primordial Nucleosynthesis” (Tony Rothman and R. A. Matzner), *The Astrophysical Journal* **257**, 450 (1982).

*52. “The Effects of Anisotropy and Dissipation on the Primordial Light Isotope Abundances” (T. Rothman and R. Matzner), *Physical Review Letters* **48**, 1565 (1982).

*53. “Second-Order Contributions to Gravitational Deflection of Light in the Parametrized Post-Newtonian Formalism” (Gary W. Richter and Richard A. Matzner), *Physical Review D* **26**, 1219 (1982).

*54. “Grand Unified Reactions and Dissipation in Anisotropic Cosmologies” (T. Rothman and R. A. Matzner), *The Astrophysical Journal* **263**, 501 (1982).

*55. “On a Non-Eclipse Optical Determination of the Gravitational Deflection of Light by the Sun” (F. Handler and R. Matzner), *Acta Astronautica* **9**, 57 (1982).

*56. “Second-Order Contributions to Gravitational Deflection of Light in the Para-metrized Post-Newtonian Formalism. II. Photon Orbits and Deflection in Three Dimensions” (Gary W. Richter and R. Matzner), *Physical Review D* **26**, 2549 (1982).

*57. “Cosmological Spatial Curvature Probed by Microwave Polarization” (B. Tolman and R. Matzner), *Physical Review D* **26**, 2951, Rapid Communications (1982).

*58. “Initial Data and Wave Propagation in One-Dimensional Inhomogeneous Cosmologies” (Richard Matzner, M. Rosenbaum and M. P. Ryan, Jr.), *Journal of Mathematical Physics* **23**, 10 (October 1982).

59. “A Numerical Computation of Nucleosynthesis in a One-Dimensional Inhomogeneous Cosmology” (Richard A. Matzner, J. M. Centrella, T. Rothman and J. R. Wilson), in *Numerical Astrophysics,* a Symposium in Honor of J. Wilson. J. Centrella, J. LeBlanc, and R. Bowers, eds. (Jones and Bartlett Publishers, Boston, 1985).

*60. “Second-Order Contributions to Relativistic Time Delay in the Parametrized Post-Newtonian Formalism” (G. Richter and R. A. Matzner), *Physical Review D* **28**, 3007 (1983).

*61. “Metaphysics of Colliding Self-Gravitating Plane Waves” (R. A. Matzner and F. Tipler), *Physical Review D* **29**, 1575 (1984).

*62. “Non-Equilibrium Processes and Primordial Nucleosynthesis” (T. Rothman and R. A. Matzner), *Nuovo Cimento Letters* **41**, 65 (1984).

*63. “Low Mass Collisionless Particles and Galaxy Formation,” *Publications of the Astronomical Society of the Pacific* **96**, 189 (1984).

*64. “Nucleosynthesis in Anisotropic Cosmologies Revisited” (T. Rothman and R. A. Matzner), *Physical Review D* **30**, 1649 (1984).

*65. “An Exact Non-Ghost Solution for a Plane-Symmetric Cosmology Containing a Classical Spinor Field” (R. A. Matzner and M. P. Ryan, Jr.), *Journal of Mathematical Physics* **25**, 2236 (1984).

*66. "Large Scale Anisotropies and Polarization of the Microwave Background Radiation in Homogeneous Cosmologies" (B. W. Tolman and R. A. Matzner), *Proc. Roy. Soc. Lond.* **A392**, 391 (1984).

*67. "Glory Scattering by Black Holes" (R. A. Matzner, C. DeWitt-Morette, B. Nelson and T. R. Zhang), *Physical Review D* **31**, 1869, (1985).

68. "Cosmic Nucleosynthesis," lectures given at the International Center for Theoretical Physics *Workshop on High Energy Physics and Cosmology,* Trieste, Italy (July 1984).

*69. "Cosmic Nucleosynthesis and Nonlinear Inhomogeneities" (J. M. Centrella, Richard A. Matzner, Tony Rothman and J. R. Wilson), *Nuclear Physics* **B216**, 171 (1986).

*70. "Anisotropy and Cosmic Nucleosynthesis of Light Isotopes including Li" (H. Kurki-Suonio and Richard A. Matzner), *Physical Review D* **31**, 1811, (1985).

71. "Numerical Cosmology: Revealing the Universe Using Computers" (J. Centrella, Richard A. Matzner and B. Tolman), in *Supercomputers: Algorithms, Architectures and Scientific Computation,* T. Tajima and A. Matsen, eds. (University of Texas Press, Austin, 1986), Chapter 6, pp. 73-96.

*72. "Numerical Analysis of Inflation" (A. Albrecht, R. Brandenberger, and Richard A. Matzner), *Physical Review D* **32**, 1280 (1985).

*73. "Professor Wheeler and the Crack of Doom: Closed Cosmologies in the 5-d Kaluza-Klein Theory" (Richard A. Matzner and A. Mezzacappa), *Foundations of Physics* **16**, 227 (March 1986).

*74. "A 3-Dimensional Closed Universe Without Collapse in 5-Dimensional Kaluza-Klein Theory" (Richard A. Matzner and A. Mezzacappa), *Physical Review D* **32**, 3114 (1985).

*75. "Behavior of Ray Optics in the Dray-'tHooft Geometry" (Richard A. Matzner), *Nuclear Physics* **B266**, 661 (1986).

*76. "Colliding Plane Waves in $N = 1$ Classical Supergravity" (M. Rosenbaum, M. Ryan, L. F. Urrutia, and Richard A. Matzner), *Physical Review D* **34**, 409 (1986).

*77. "A Conjecture on Isotope Production in the Bianchi Cosmologies" (Richard A. Matzner, Tony Rothman, and G. F. R. Ellis), *Physical Review D* **34**, 292 (1986).

78. "The LAGEOS Gravitational Experiment" (I. Ciufolini and Richard A. Matzner), *Proceedings of the 1985 Marcel Grossman Meeting,* Rome, R. Ruffini, ed. (World Scientific, 1988).

*79. "Inflation from Inhomogeneous Initial Data in 1-d Backreacting Cosmology," (H. Kurki-Suonio, J. Centrella, Richard A. Matzner and J. R. Wilson), *Physical Review D* **35**, 435 (1987).

80. "Numerical Analysis of Inflation" (Richard A. Matzner), in *Dynamical Spacetimes and Numerical Relativity,* J. Centrella, ed. (Cambridge University Press, Cambridge, 1986).

*81. "Inflation and Bubbles in General Relativity" (P. Laguna-Castillo and R. Matzner), *Physical Review D* **34**, 2913 (1986).

*82. "Cosmic Nucleosynthesis," *Publications of the Astronomical Society of the Pacific* **98**, 1049 (1986).

*83. "Surfaces of Discontinuity in 5-Dimensional Kaluza-Klein Cosmologies" (P. Laguna-Castillo and R. Matzner), *Nuclear Physics* **B282**, 542 (1987).

*84. "Inflation with Generalized Initial Conditions" (A. Albrecht, R. Brandenberger, and R. Matzner), *Physical Review D* **35**, 429 (1987).

*85. "Discontinuity Cylinder Model of Gravitating $U(1)$ Cosmic Strings" (P. Laguna-Castillo and Richard A. Matzner), *Physical Review D* **35**, 2933 (1987).

*86. "Singularities in Kaluza-Klein-Friedmann Cosmological Models" (M. Rosenbaum, M. Ryan, L. Urrutia and Richard A. Matzner), *Physical Review D* **36**, 1032 (1987).

*87. "Coupled Field Solutions for $U(1)$ Gauge Cosmic Strings" (P. Laguna-Castillo and Richard A. Matzner), *Physical Review D* **36**, 3663 (1987).

*88. "Interaction of $U(1)$ Cosmic Strings: Numerical Intercommutation" (Richard A. Matzner), *Computers in Physics* **2**, No. 5, p. 51 (Sept/Oct 1988).

89. "Primordial Nucleosynthesis in a Universe with Nonlinear Inhomogeneities" (Richard A. Matzner, J. M. Centrella, T. Rothman, and James R. Wilson), in *Origin and Distribution of the Elements,* G. Mathews, ed. (World Scientific, Singapore, 1988).

90. "Old English Conductors" (Richard A. Matzner), *New York Times Book Review*, November 1, 1987, p. 38 (letter to the editor).

*91. "Behavior of Chaotic Inflation in Anisotropic Cosmologies with Nonminimal Coupling" (Toshifumi Futamase, Tony Rothman, and Richard A. Matzner), *Physical Review D* **39**, 405 (1989).

*92. "Inhomogeneous Nucleosynthesis with Neutron Diffusion" (Hannu Kurki-Suonio, Joan M. Centrella, Richard A. Matzner, Tony Rothman, and James R. Wilson), *Physical Review D* **38**, 1091 (1988).

93. "Interaction of Cosmic Strings" (Richard A. Matzner), in *Proceedings of the First International Conference on Computational Physics,* D-Y Li and D-H Feng, ed. (World Scientific, Singapore, 1989).

94. "General Relativistic Radiation Hydrodynamics in Spherically Symmetric Spacetimes" (A. Mezzacappa and Richard A. Matzner), in *Frontiers in Numerical Relativity*, C. Evans, D. Hobill, and S. Finn, eds. (Cambridge University Press, Cambridge, 1989).

*95. Nonlinear Solutions for Initial Data in the Vacuum Einstein Equations in Plane Symmetry" (Peter Anninos, J. Centrella, and Richard A. Matzner), *Physical Review D* **39**, 2155 (1989).

96. "The Pregalactic Cosmic Gravitational Wave Background" (Richard A. Matzner), in *Relativistic Gravitational Experiments in Space (Proceedings of the Workshop),* held in Annapolis, Maryland, June 28–30, 1988, R. Hellings, ed., NASA Technical Publication NASA CP-3046 (National Technical Information Service, Springfield, VA 22161-2171, 1989).

97. "Computational Dynamics of $U(1)$ Gauge Strings: Probability of Reconnection of Cosmic Strings" (Richard A. Matzner), in *Frontiers in Numerical Relativity,* C. Evans, D. Hobill, and S. Finn, eds. (Cambridge University Press, Cambridge, 1989).

98. "Initial Value Solutions in Planar Cosmologies" (Peter Anninos, Joan Centrella, and Richard A. Matzner), in *Frontiers in Numerical Relativity,* C. Evans, D. Hobill, and S. Finn, eds. (Cambridge University Press, Cambridge, 1989).

*99. "Effect of Small-Scale Baryon Inhomogeneity on Cosmic Nucleosynthesis" (H. Kurki-Suonio and Richard A. Matzner), *Physical Review D* **39**, 1046 (1989).

100. "Probability of Interconnection of Cosmic Strings" (Richard A. Matzner and D. Jill McCracken), in *Cosmic Strings, the Current Status (Proceedings of Yale Conference on Cosmic Strings)*, Frank Accetta and Lawrence Krause, eds. (World Scientific, Singapore, 1988).

*101. "Computer Simulation of Time-Dependent, Spherically Symmetric Spacetimes Containing Radiating Fluids: Formalism and Code Tests" (Anthony Mezzacappa and Richard A. Matzner), *The Astrophysical Journal* **343**, 853 (August 15, 1989).

102. "Recent Developments in Cosmology" (Richard A. Matzner and D. Jill McCracken), in *Proceedings of the VIIIth Italian Conference on General Relativity*, Cerdonio, Cianci, Francaviglia, and Toller, eds. (World Scientific, Singapore, 1989).

103. "The Interaction of Cosmic Strings: A Study of Research and Teaching Graphics" (Richard A. Matzner), in *Proceedings of Supercomputing 1988* (J.L. Martin and S.F. Landstrom, editors) (Computer Society Press, Washington, DC, 1989).

*104. "Peeling $U(1)$ Gauge Cosmic Strings" (P. Laguna and Richard A. Matzner), *Physical Review Letters* **62**, 1948 (1989).

*105. "Numerical Simulation of Bosonic Superconducting String Interactions" (P. Laguna and Richard A. Matzner), *Physical Review D* **41,** 1751 (1990).

*106. "Big Bang Nucleosynthesis and the Quark-Hadron Transition" (H. Kurki-Suonio, Richard A. Matzner, K. A. Olive, and D. N. Schramm), *The Astrophysical Journal* **353,** 406 (1990).

107. "Current Status of Cosmic String Interactions" (Richard A. Matzner and P. Laguna), *Proceedings of the Third Regional Conference in Mathematical Physics,* F. Hussain and A. Qadir, eds. (World Press, Singapore, 1990).

*108. "Overproduction of ^{4}He in strongly inhomogeneous $\Omega_b = 1$ models of primordial nucleosynthesis" (H. Kurki-Suonio and Richard A. Matzner), *Physical Review D* **42**, 1047 (1990).

*109. "Numerical Methods for Solving the Planar Vacuum Einstein Equations" (Peter Anninos, Joan Centrella, and Richard A. Matzner), *Physical Review D*15 **43**, 1808 (1991).

*110. "Nonlinear Wave Solutions to the Planar Vacuum Einstein Equations" (Peter Anninos, Joan Centrella, and Richard A. Matzner), *Physical Review D*15 **43**, 1825 (1991).

*111. "How Does Inflation Isotropize the Universe?" (Peter Anninos, Richard A. Matzner, Tony Rothman, and Michael P. Ryan, Jr.), *Physical Review D*15 **43** 3821 (1991).

*112. “Non-Riemannian Theories of Gravity and Lunar and Satellite Laser Ranging” (I. Ciufolini and Richard A. Matzner), *Internation. Journal Modern Physics A* **7** (1992).

*113. “3-D Numerical Cosmology” *Annals N.Y. Academy of Science* **631** 1 (August 1991).

114. “Numerical Relativity” in *SILARG VII*, J. D’Olivo, E. Nachmad-Achar, M. Rosenbaum, M. Ryan, L. Urrutia, F. Zertuche eds. (World Scientific, Singapore, 1991).

*115. “Fractal Structure in the Scalar $\lambda\left(\phi^2-1\right)^2$ Theory” (Peter Anninos, Samuel Oliveira, and Richard A. Matzner), *Physical Review D* **44** 1147 (Aug. 15, 1991).

116. “Three Dimensional Numerical Study of Inhomogeneous Chaotic Inflation” (P. Laguna, H. Kurki-Suonio, and Richard A. Matzner) *Proceedings of Sixth Marcel Grossmann Conference on General Relativity*, (T. Nakamura, ed.; Tokyo 1992).

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Gerald Campbell	(degree awarded December 1974)
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