

SIDNEY A. BLUDMAN

EDUCATION

- Cornell University, A.B., 1945
- Yale University, M.S., 1948; Ph.D., Yale University, 1951

PROFESSIONAL RECORD

- U.S. Navy Service (Naval Ordnance Laboratory), 1945-46
- Assistant Professor, Lehigh University, 1950-2
- Staff Physicist, Lawrence Radiation Laboratory and Lecturer, University of California, Berkeley, 1952-61
- Visiting Member, Institute for Advanced Study, 1956-7
- University of Pennsylvania: Associate Professor, 1961-64; Professor, 1964-99
- Visiting Research Fellow, Imperial College, 1967-68
- Visiting Professor, Tel-Aviv University, 1971-72
- Lady Davis Visiting Professor, Hebrew University, 1976-77
- Guggenheim Fellowship, 1983-84
- Visiting Member, Institute for Theoretical Physics, University of California, Santa Barbara, 1985; Fall, 1997
- Scientific Director, Les Houches Summer Institute on Supernova, 1990
- Visiting Professor, Center for Particle Astrophysics, University of California, Berkeley, 1990-91; Summers, 1992, 1993
- Scientific Visitor, Institute for Nuclear and Particle Astrophysics, Lawrence Berkeley Laboratory, Berkeley, Summers, 1994, 1995
- Scientific Visitor, Institute for Nuclear Theory, University of Washington, Summer, 1996
- Theory Group, DESY, Hamburg 1998-2006
- Visiting Professor, Departamento de Astronomia, Universidad de Chile, Santiago 2006-

HONORS AND MEMBERSHIPS

- Fellow: American Physical Society, American Association for the Advancement of Science
- Honorary M.S., University of Pennsylvania
- Award Committee on Arts and Sciences, Franklin Institute
- Member: Sigma Xi, American Astronomical Society, American Physical Society, International Astron. Union
- Committee on International Freedom of Scientists, American Physical Society

AREAS OF INTEREST

- Symmetry Principles and Weak Interactions in Particle Physics
- Relativistic Astrophysics: Superdense Matter; Neutron Stars; Stellar Collapse
- Neutrino Astrophysics and Cosmology

PUBLICATIONS BY SIDNEY A. BLUDMAN (156)

1 NUCLEAR PHYSICS (6)

- 1954a: Hard Core Interpretation of the Reaction $p + d \rightarrow \pi^+ + t$, Phys. Rev. **94**, 1722 (1954).
- 1954c: Validity of the Born-Oppenheimer Approximation (with P.B. Daitch), Phys. Rev. **95**, 823 (1954).
- 1954d: Theoretical Study of a Source of Intermediate Energy Neutrons, UCRL-2449 (Jan. 7, 1954, unpublished).
- 1976b: Equation of State of an Ideal Fermi Gas (with K. A. Van Riper), Astrophys. Journal **212**, 859 (1977).
- 1976c: Composition and Equation of State of Thermally Dissociated Matter (with K. A. Van Riper), Astrophys. J. **213**, 239 (1977).
- 1980b: Extrapolation of the Phenomenological Nuclear Equation of State to High Densities (with C.B. Dover), Phys. Rev. **D22**, 1333 (1980).

2 GAUGE SYMMETRIES AND SPONTANEOUS SYMMETRY BREAKING (10)

- 1955a: Extended Isotopic Spin Invariance and Meson-Nucleon Coupling, Phys. Rev. **100**, 372 (1955).
- 1958b: On the Universal Fermi Interaction. Nuovo Cimento **9**, 550 (1958).
- 1963d: Broken Symmetries and Massless Particles (with A. Klein), Phys. Rev. **131**, 5, 2364-2372, (1963).
- 1963e: Broken Symmetries and Massless Particles (with A. Klein), *Proc. Midwest Conf. on Theoretical Physics*, p. 50-64 (Univ. of Notre Dame, 1963).
- 1966a: Broken Symmetries and Massless Particles, *Proceedings of Seminar on Unified Theories of Elementary Particles* (ed. by H. Richeuberg, Max-Planck Institute, Munich, 1966).
- 1966b: Unified Theories of Elementary Particles, Physics Today **19**, 55 (1966).
- 1966c: Hidden Symmetries and the Question of Massless Particles, *High-Energy Physics*, Vol. II of Tokyo Summer Lectures in Theoretical Physics (W. A. Benjamin, 1966).
- 1979f: Unified, Yes, Renormalized Maybe, Nature **282**, 280 (1979).
- 1992c: The First Gauge Theory of Weak Interactions and the Prediction of Weak Neutral Currents, *Proc. Third International Symp. on the History of Particle Physics: "The Rise of the Standard Model"* (AIP Conf. Proc. 1992).
- 1993a: The Role of Gauge Theory, Symmetry-Breaking and Electroweak Unification in the Discovery of Weak Neutral Currents, *Discovery of Weak Neutral Currents: The Weak Interaction Before and After* (ed. A. K. Mann and D. B. Cline, AIP Conf. Proc. 300, 1994).

3 NEUTRINO PHYSICS AND WEAK INTERACTIONS (18)

- 1956a: Radiative and Nonradiative Boson Decay into Leptons (with M. A. Ruderman), *Phys. Rev.* **101**, 910 (1956).
- 1956b: Interpretation of K-Meson Decays, *Phys. Rev.* **102**, 1420 (1956).
- 1957c: Recent Developments in the Theory of Weak Interactions. *Bull. Am. Phys. Soc.* **2**, 316 (1957) (Invited paper).
- 1958a: Phenomenological Analysis of μ Decay (with A. Klein), *Phys. Rev.* **109**, 550 (1958).
- 1959a: Two-Neutrino Hypothesis, *Bull. Am. Phys. Soc.* **4**, 80 (1959) (Gatlinburg Conference, 1958).
- 1959: Phenomenological Analysis of Hyperon Decay, *Phys. Rev.* **115**, 468 (1959).
- 1960a: Radiative Pion Decay into Electrons (with J. A. Young), *Phys. Rev.* **118**, 602 (1960).
- 1960d: Electromagnetic Properties of Charged Vector Meson Intermediary in Weak Interactions (with J. A. Young), *Proc. 1960 Annual International Conference on High Energy Physics at Rochester*, 564.
- 1961: Absence of $\mu - e$ Conversion Processes and the $\Delta I = 1/2$ Rule, *Phys. Rev.* **124**, 947 (1961).
- 1962: Electromagnetic Production of Charged Vector Mesons (with J. A. Young), *Phys. Rev.* **126**, 303, (1962).
- 1963a: Electromagnetic Properties of a Charged Vector Meson (with J. A. Young), *Phys. Rev.* **131**, 5, 2326-2334 (1963).
- 1964a: Further Analysis of the Decay $\pi \rightarrow e + \nu + \gamma$ (with Stanley G. Brown), *Phys. Rev.* **136** B213 (1965).
- 1965: $K_2 \rightarrow \pi^+ + \pi^-$ and the Question of Bose Statistics for Pions, *Phys. Rev.* **133**, B213 (1965).
- 1967a: Non-Leptonic Weak Interactions, *Weak Interactions and Symmetry Principles* (Gordon and Breach, 1967).
- 1970b: Nonleptonic Hyperon Decays (with J. Shimada), *Phys. Rev.* **D**, 1, 2687-2695 (1970).
- 1963b: Two Neutrinos or One? *Il Nuovo Cimento Serie X*, Vol. 27, 751-760 (1963).
- 1963c: One Four-Component Neutrino, *Proc. Eastern Theoretical Physics Conference* (Gordon and Breach, 1963).
- 1964b: Electromagnetic Form Factor of the Neutrino (with W. K. Cheng), *Phys. Rev.* **136**, B1787 (1964).

4 FIELD THEORY (6)

- 1954b: Classical Radiation from Moving Charges, *Phys. Rev.* **95**, 654 (A), (1954).
- 1957b: Some Theoretical Consequences of a Particle Having Mass Zero, *Phys. Rev.* **107**, 1163 (1957).
- 1966d: Distinction between Composite and Elementary Particles in a Model Field Theory (With N. G. Deshpande), *Phys. Rev.* **143**, 1239 (1966).
- 1966e: Spontaneously Broken Symmetries and the Question of Massless Particles in a Model Field Theory (with N. G. Deshpande), *Phys. Rev.* **143** 1239 (1966).
- 1966f: Vanishing Renormalization Constants and Spontaneous Generation of Symmetries (with N. G. Deshpande), *Nuovo Cimento* **45**, 656 (1966).
- 1967b: Applications of the Dirac-Schwinger Covariance Condition in Quantum Electrodynamics (with S. Brown), *Phys. Rev.* **161**, 1505-1512 (1967).

5 STATISTICAL MECHANICS AND MISCELLANEOUS (5)

- 1951: On the Application of Solutions of Schroedinger's Equation to Problems of Normal Mode Propagation, WH01-51-77 (Sept. 1951, unpublished).
- 1957a: Aberrations and Fringing Effects in a 180 deg Double Focussing Magnetic Spectrometer (with D. L. Judd), *Nuclear Inst.* **1**, 46 (1957).
- 1960b: Statistical Mechanics of Relativistic Streams (with M. N. Rosenbluth and K. M. Watson, *Physics of Fluids* **3**, 741, 1960).
- 1960c: Stability of an Infinite Uniform Stream Penetrating Cold Plasma (with M. N. Rosenbluth and K. M. Watson), *Physics of Fluids* **3**, 747 (1960).
- 2004b: Nonequilibrium Thermodynamics of Radiation and Matter (with C. Essex and D.C. Kennedy), *Variational and Extremum Principles in Macroscopic Systems* (Elsevier, 2004)

6 RELATIVISTIC ASTROPHYSICS (6)

- 1960e: Equivalence Principle. General Relativity and Their Observational Tests, UCRL-9176 (March, 1960, unpublished).
- 1968: Possibility of the Speed of Sound Exceeding the Speed of Light in Ultradense Matter (with M. A. Ruderman), *Phys. Rev.* **170**, 1176-1184 (1968).
- 1970a: Non-causality and Instability in Ultradense Matter (with M. A. Ruderman), *Phys. Rev.* **D1**, 3243-3246 (1970).
- 1972: Equation of State of Ultradense Relativistic Matter, *Developments in High Energy Physics, Proc. of the International Summer School of Physics "Enrico Fermi" LIV Corso* (Varenna, 1971).
- 1973a: Stability of Relativistic Polytropes, *Ap. J.* **183**, 637 (1973).
- 1973b: Simple Calculation of Critical Parameters of Neutron Stars, *Ap. J.* **183**, 649 (1973).

7 NEUTRINO ASTROPHYSICS AND COSMIC RAYS (55)

- 1973d: Neutrinos from Collapsing Stars, *Topical Seminar on Weak Interactions* (IC/473/133, Trieste, 1973).
- 1974b: Antineutrino Pulses from Vibrations of a Newly Formed Hot Neutron Star (with J. M. Cohen and K. Lande), *General Relativity and Gravitation Journal* (1975).
- 1975a: Bounds on Neutrino Burst Intensity Imposed by the Exclusion Principle and Causality (with M. A. Ruderman), *Astroph. J.* **195**, L19 (1975).
- 1975b: Neutrino Astrophysics, *Annals of N.Y. Acad. Sci.* **262**, 181 (1975) (Proc. VIIth Texas Symposium on Relativistic Astrophysics).
- 1975c: Astrophysical Implications of Recent Developments in Neutrino Physics, *Orbis Scientiae II*, (Coral Gables, 1975).
- 1975d: Neutrino Dynamics in Stellar Collapse *Neutrino-75, Fifth International Conference on Neutrino Science* (Balatonfured, 1975).
- 1976a: Theoretical Limits on Interstellar Magnetic Poles Set by Nearby Magnetic Fields (with M. A. Ruderman), *Phys. Rev. Lett.* **36**, 840 (1976).
- 1976d: Neutrino Transport in Collapsing Stars, *Proc. 1976 Intl. Neutrino Conference* (Aachen, 1976).

- 1976e: Diffusion Approximation of Neutrino Fluxes Out of Collapsing Stars, *Proc. DUMAND Workshop* (Hawaii, 1976).
- 1977b: Neutron Transport Methods in Neutrino Transport Calculations (with I. Lichtenstadt, A. Ron, N. Sack and J. J. Wagschal), *Nuclear Sci. and Engineering* **64**, 294 (1977).
- 1977c: Can Reactor Physicists Do Neutrino Transport? (with I. Lichtenstadt, A. Ron, N. Sack, and J. J. Wagschal), *Trans. Isr. Nucl. Soc.* **4**, 27 (1976).
- 1978a: Effects of Neutrino Degeneracy and of Downscatter on Neutrino Radiation from Dense Stellar Cores (with I. Lichtenstadt, A. Ron, N. Sack and J. J. Wagschal), *Astrophys. J.* **226**, 222 (1978).
- 1978b: Diffusion Approximation to Neutrino Transport in Dense Matter (with K. A. Van Riper), *Astrophys. J.* **224**, 631 (1978).
- 1979c: Time-Dependent Neutrino Transport Out of Dense Stellar Cores (with I. Lichtenstadt, A. Ron, N. Sack, and J. J. Wagschal), *Astron. and Space Sci.* **71**, 219 (1980).
- 1979e: Effects of the Equation of State on the Outcome of Stellar Collapse, (with N. Sack and I. Lichtenstadt), *Astrophys. J.* **237**, 903 (1980).
- 1980a: Thermal Stiffness of Warm Nuclear Matter and Supernova Explosions by Shock Heating (with N. Sack and I. Lichtenstadt), *Astrophys. J.* **237**, 903 (1980).
- 1980c: Electron Capture as Supernova Killer (with I. Goldberg, N. Sack, I. Lichtenstadt) *Abhand. Akad. Wiss. Gottingen, Math-Physik Kl. III*, Nr. 33).
- 1982a: Homologous Collapse and Deleptonization of an Evolved Stellar Core (with I. Lichtenstadt and G. Hayden), *Astrophys. J.* **261**, 661 (1982).
- 1982b: Adiabatic Collapse and Explosion of Low-Mass Iron Stellar Cores (with I. Lichtenstadt), *Numerical Astrophysics* (ed. J. Centrella, Univ. of Illinois, 1982).
- 1983a: Effect of Initial Thermal Structure on the Collapse and Explosion of Iron Stellar Cores (with I. Lichtenstadt), *Astrophys. J.* **276**, 746 (1984).
- 1983b: Calculation of Cosmic Ray Neutrino Flux (with T. K. Gaisser, T. Stanev and H. Lee), *18th International Cosmic Ray Conference* (Bangalore, 1983).
- 1983c: Flux of Atmospheric Neutrinos (with T. K. Gaisser, T. Stanev, and H. Lee), *Phys. Rev. Lett.* **51**, 223 (1984).
- 1983d: Angular Distribution and Flux of Atmospheric Neutrinos (with T. K. Gaisser, T. Stanev, and H. S. Lee) *Proc. Fourth Workshop on Grand Unification* (Philadelphia, 1983).
- 1983e: An Analytic Treatment of Air Shower Development: Depth of Shower Maximum (with M. L. Cherry, A. Dar), UPR-022T, unpublished, 1983.
- 1984b: Neutrino Production from Discrete High Energy Gamma Ray Source (with H. Lee), *Astrophys. J.* **290**, 28 (1985).
- 1985a: Three Dimensional Calculation of Flux of Low Energy Atmospheric Neutrinos (with H. Lee), *Proc. XIX Intl. Cosmic Ray Conference, La Jolla* **5**, 454 (1985).
- 1986a: Low Energy Atmospheric Neutrinos (with H. Lee), *Phys. Rev.* **D37**, 122 (1985).
- 1986b: A Calculation of Low Energy Atmospheric Muon Flux. (with H. Lee) submitted to *Phys. Rev. Lett.*, UPR-0306 T-Rev, unpublished, 1986.
- 1986c: The Effects of Neutrino Transport on the Collapse of Iron Stellar Cores. (with E. Myra, Y. Hoffman, I. Lichtenstadt, N. Sack and K. van Riper), *Astrophys. J.* **318**, 744 (1988).

- 1987a: General Relativistic Collapse with a Soft Nuclear Equation of State, *Phys. Reports* **163**, 47 (1988).
- 1987b: Theoretical Significance of Detecting Neutrinos from Supernova 1987A (with P. J. Schinder), UPR-0326T, unpublished, 1987.
- 1987c: Statistical Analysis of the Time Structure of the Neutrinos from Supernova 1987a, (with P. J. Schinder), *Astrophys. J.* **326**, 265 (1988).
- 1987d: Statistical Analysis of the Time Structure of the Neutrinos from 1987A (with P. J. Schinder), *Supernova 1987A in the Large Magellanic Cloud*, (ed. M. Kafatos and A. Michalitsianos, Cambridge Univ. Press, 1988).
- 1987e: Supernova Neutrino Dynamics: What We have Not Learned From Supernova 1987A and What to Expect From the Coming Galactic Supernova (with P. J. Schinder), *Neutrino Astronomy*, (ed. D. Cline, World Scientific, 1988).
- 1988a: General Relativistic Implicit Hydrodynamics in Polar Sliced Space-Time (with P. J. Schinder and T. Piran), *Phys. Rev.* **D37**, 2722 (1988).
- 1988b: Theoretical Mechanisms for Type II Explosion Dynamics, P. 487-493, *Dark Matter* (ed. J. Tran Than Van, Editions Frontieres, Gif-sur-Yvette, 1988).
- 1988c: General Features of Neutrino Explosion Dynamics Revealed by Supernova 1987a (with P. J. Schinder), 461-470, *Dark Matter*, (ed. J. Tran Than Van, Editions Frontieres, Gif-sur-Yvette, 1988).
- 1988d: Neutrino Transport and the Prompt Mechanism for Type II Supernova (with E. Myra), *Astrophys. J.* **340**, 384 (1989).
- 1988e: Radiative Transport in Spherical Static Space-Time: General Relativistic Tangent-Ray Method for the Variable Eddington Factors (with P. J. Schinder), *Astrophys. J.* **346**, 350 (1989).
- 1989a: General Relativistic Hydrodynamics and Radiation Transport (with P. J. Schinder), *N.Y. Acad. Sci.* **571**, 205 (1990).
- 1989b: Type II Supernova Dynamics, in *Particle Astrophysics: Forefront Experimental Issues* (ed. E. S. Norman, World Scientific 1989).
- 1989d: Supernova and Solar Neutrinos, *Nuclear Physics B, Proceedings Supplements* **14B**, 179 (1990).
- 1989e: Relativistic Neutrino Transport in Stellar Collapse, (with P. J. Schinder) in *Supernovae* (ed. S. E. Woosley, Springer-Verlag, 1990).
- 1990a: Neutrino Flavor-Spin Oscillations in the Sun, *Particles, Strings and Cosmology, Proceedings of Pascos-90, Northeastern University* (ed. P. Nath and S. Reucroft, World Scientific, 1991).
- 1990c: Preface to *Supernovae*, Session LIV of Les Houches NATO ASI, (ed. Bludman *et al.*, Elsevier, 1994).
- 1991a: Preliminary Estimates of Core-Collapsed Supernovae Rates from the Berkeley Automated Supernova Search, (with C. Pennypacker, S. Permuter, R. A. Muller, N. Hamilton, C. Smith, T. Sassen, S. Carlson, H. Marvin, L. P. Wang, F. Crawford, R. Treffers), *Proceedings of the UCLA Supernova Watch Workshop* (World Scientific, 1991).
- 1991c: Seesaw Model Predictions for the Tau-Neutrino Mass (with D. C. Kennedy and P. G. Langacker), *Phys. Rev.* **D45**, 1810 (1991).
- 1991d: Neutrino Masses and Lifetimes, *Proc. First Intl. A. Sakharov Conf. on Physics, Moscow*, (Nova Science Publ., 1991).
- 1991e: Improved Cosmological and Radiative Decay Constraints on Neutrino Masses and Lifetimes, *Phys. Rev.* **D45**, 4720 (1992).

- 1992a: Cosmological and Astrophysical Bounds on Neutrino Masses and Lifetimes, *Discovery of the Neutrino* (ed. C.E. Lane and R.I. Steinberg, World Scientific, 1993).
- 1993c: Maximum Entropy Distribution and Closure for Bose-Einstein and Fermi-Dirac Radiation Transport, (with J. Cernohorsky), *Astrophys. J.* **433**, 250 (1994).
- 1994b: Neutrino Transport in Type II Supernovae, (with Cernohorsky), *The Physics of Supernovae*, *Physics Reports* **256**, 37 (1995).
- 1994c: Preface, (with Feng, Gaisser, Pittel), *The Physics of Supernovae*, *Physics Reports* **256**, 3 (1995).
- 1995a: Accurate Neutrino Transport is Critical to the Supernova Explosion Mechanism, *Bull. 185th Meeting of Amer. Astron. Soc.*, 1995.
- 1999d: Closure in Flux Limited Neutrino Diffusion and Two Moment Transport, (with J.M. Smit, L.J. van den Horn), *Astronomy and Astrophysics* **356**, 559 (2000).

8 SOLAR NEUTRINOS AND STELLAR STRUCTURE (10)

- 1973c: Review of the Solar Neutrino Puzzle, *Topical Seminar on Weak Interactions* (IC/73/133, Trieste, 1973).
- 1990b: Solar Neutrinos: Physics Beyond the Standard Model?, *SISupernovae*, Session LIV of Les Houches NATO ASI, (ed. Bludman et al., Elsevier, 1994).
- 1991b: Solutions to the Solar Neutrino Problem, with D. C. Kennedy and P. G. Langacker, *Nuclear Physics* **B373**, 498 (1992).
- 1992b: Theoretical Implications of the Combined Solar Neutrino Observations, (with D. C. Kennedy and P. G. Langacker), *Nucl. Phys.* **B374**, 373 (1992).
- 1992d Implications of Combined Solar Neutrino Observations and and Their Theoretical Uncertainties, with N. Hata, D.C. Kennedy and P.G. Langacker, *Phys. Rev.* **D47**, 2220 (1993).
- 1993b: Astrophysical Solutions are Incompatible with the Solar Neutrino Observations, (with N. Hata, P. Langacker), *Phys. Rev.* **D49**, 3622 (1994).
- 1996a: Solar Core Homology, Solar Neutrinos and Helioseismology, (with Kennedy), *Astrophys. J.* **472**, 412 (1996).
- 1998b: Variational Principles for Stellar Structure, (with D.C. Kennedy), *Astrophys. J.* **484**, 329 (1997); **492**, 854 (1998).
- 1999a: Analytic Models for the Mechanical Structure of the Solar Core, (with D.C. Kennedy), *Astrophys. J.* **525**, 1024 (1999).
- 1999b: A Modern Approach to the Lane-Emden Equation, UPR-757T.

9 COSMOLOGY (30)

- 1974a: Cosmological Neutrinos, *Neutrinos-1974, Proc. Intl. Conf. on Neutrino Physics and Astrophysics, Philadelphia, Pa.* (ed. C. Baltay, American Institute of Physics, New York, 1974).
- 1974c: Neutrino Cosmology, *General Relativity and Gravitation* **7**, 569 (1975).
- 1977a: Induced Cosmological Constant Expected above the Phase Transition Restoring Broken Symmetry (with M. A. Ruderman), *Phys. Rev. Lett.* **38**, 255 (1977).

- 1979a: Clusters of Galaxies Compared with N-Body Stimulations: Density Profiles (with M. F. Struble), *Astron. J.* **84**, 40 (1979).
- 1979f: Elementary Particle Symmetry Restoration can Prevent a Cosmological Singularity, unpublished, 1979.
- 1981a: The Early Universe, Chairman's Summary at Xth Symposium on Relativistic Astrophysics, Dec. 15-19, 1980, *Annals N.Y. Acad. Sci.* **375**, 419 (1981).
- 1981b: Elementary Particle Phase Transitions in the Very Early Universe, *Cosmology and Particles*, Editiones Frontieres (ed. Adouze et al., Paris, 1981).
- 1982c: Grand Unification Can Avoid the Initial Cosmological Singularity, unpublished, 1982.
- 1982d: Particle Phase Transitions Can Prevent an Initial Cosmological Singularity, *The Early Universe* (I.A.U. Symposium No. 104, D. Reidel Publishing Company, 1982).
- 1983f: Thermodynamics and the End of a Closed Universe, *Nature* **308**, 319 (1984).
- 1984a: Can Unclustered Matter Close the Universe? (with Y. Hoffman), *Phys. Rev. Lett.* **52**, 2087 (1984).
- 1989c: Cosmological Neutrinos and Other Dark Matter, *Nucl. Physics B, Proceedings Supplements* **14B**, 149 (1990).
- 1995b: Big Bang Nucleosynthesis in Crisis, (with Hata, Scherrer, Steigman, Thomas, Walker and Langacker), *Phys. Rev. Lett.* **75**, 3977 (1995).
- 1996b: Deuterium Abundances and Cluster Baryon Fractions Used to Obtain Baryonic and Total Mass Densities, *Neutrinos, Dark Matter and the Universe* (Rencontres de Blois, 1996).
- 1997a: Cosmological Implications of Two Conflicting Deuterium Abundances, (with Hata, Steigman, Langacker), *Phys. Rev.* **D55**, 540 (1997).
- 1998a: Baryonic Mass Fraction in Rich Clusters and the Total Mass Density in the Cosmos, *Astrophys. J.* **508**, 535 (1998).
- 1999c: Vacuum Energy: If Not Now, Then When?, *PANIC '99, Proc. 15th International Conf. Particles & Nuclei, Uppsala, 1999* (ed. Faeldt et al., Elsevier, 2000), 865c.
- 1999e: Vacuum Energy: Es Muss Sein, *Proc. Joint European & National Astronomical Conference, Toulouse (1999)*, to be published.
- 2000a: Observed Smooth Energy is Anthropically Even More Likely As Quintessence Than As Cosmological Constant, astro-ph/0002204, *Proc. Third Intl. Workshop on Particle Physics and the Early Universe, COSMO-99* (ed. U. Cotti et al, World Scientific, 2000), 113.
- 2000b: Smooth Energy: Cosmological Constant or Quintessence?, (with M. Roos), *Astroph. J.* **547**, 77 (2001).
- 2001a: Quintessence Cosmology, *Cosmic Evolution* (ed. E. Vangioni-Flam et al, World Scientific, 2001), 317.
- 2001b: Quintessence Cosmology and the Cosmic Coincidence, (with M. Roos), DESY 01-147, astro-ph/0109551, *Phys. Rev.* **D65**, 043503 (2002).
- 2001c: Observed Smooth Energy Fitted by Parametrized Quintessence, *Proc. TAUP2001*, DESY 01-165, astro-ph/0110489.
- 2003a: Critique of Tracking Quintessence, *Multiwavelength Cosmology* (ed. M. Plionis (Kluwer, 2004).
- 2003b: What We Already Know About Tracking Quintessence, *Neutrino Oscillations in Venice*, ed. M. Baldo Ceolin (Edizioni Papergraf).

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- 2010a: Classical Scaling Symmetry Implies Useful Nonconservation Laws, arXiv:1002.4670 .
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10 BOOK REVIEWS (5)

- 1961b: T.C. Schelling and M.H. Halperin, *Strategy and Arms Control* (Twentieth Century Fund, 1961), Bull. Atomic Scientists, 1961
- 1980d: *Recent Developments in Gravitation, Cargese, 1978* (ed. M. Levy and S. Deser, Plenum Press, 1979), Science **208**, 589 (1980)
- 1980e: *General Relativity and Gravitation* (ed. A. Held, Plenum Press, 1980), Science **209**, 1234 (1980)
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- 1994a: R.E. Marshak, *Conceptual Foundations of Modern Particle Physics* (World Scientific, 1993), Physics Today **47**, 63 (1994).