

Publications of FrankWilczek

1. Ultraviolet Behavior of Non-Abelian Gauge Theories (with D. Gross), *Phys. Rev. Lett.* **30**, 1343 (1973). Doi: 10.1103/PhysRevLett.30.1343 [PDF](#)
2. Asymptotically Free Gauge Theories, I (with D. Gross), *Phys. Rev. D* **8**, 3633 (1973). Doi: 10.1103/PhysRevD.8.3633 [PDF](#)
3. Asymptotically Free Gauge Theories, II (with D. Gross), *Phys. Rev. D* **9**, 980 (1974). Doi: 10.1103/PhysRevD.9.980 [PDF](#)
4. Gauge Dependence of Renormalization Group Parameters (with W. Caswell), *Phys. Lett.* **B49**, 291 (1974) Doi: 10.1016/0370-2693(74)90437-7 [PDF](#)
5. Possible Non-Regge Behavior of Electroproduction Structure Functions (with A. DeRujula, S.L. Glashow, H.D. Politzer, S.B. Treiman and A. Zee), *Phys. Rev. D* **10**, 1649 (1974). Doi: 10.1103/PhysRevD.10.1649 [PDF](#)
6. Scaling Deviations for Neutrino Reactions in Asymptotically Free Field Theories (with S. Treiman and A. Zee) *Phys. Rev. D* **10**, 2881 (1974) DOI: 10.1103/PhysRevD.10.2881 [PDF](#)
7. Implications of Anomalous Lorentz Structure in Neutral Weak Processes (with R. Kingsley and A. Zee), *Phys. Rev. D* **10**, 2216 (1974). DOI: 10.1103/PhysRevD.10.2216 [PDF](#)
8. Scaling Properties of a Gauge Theory with Han-Nambu Quarks and Charged Vector Gluons (with T.P. Cheng), *Phys. Lett.* **53B**, 269 (1974). DOI: 10.1016/0370-2693(74)90476-6 [PDF](#)
9. Some Experimental Consequences of Asymptotic Freedom, Proceedings: *AIP Conference #23*, 596, AIP Press, (1975). DOI: 10.1063/1.2947451
10. Tests of Coupling Types in Weak Muonless Reactions (with R.L. Kingsley, R. Shrock and S.B. Treiman), *Phys. Rev. D* **11**, 1043 (1975). DOI: 10.1103/PhysRevD.11.1043 [PDF](#)
11. Remarks on the New Resonances at 3.1 GeV and 3.7 GeV (with C.G. Callan, R.L. Kingsley, S.B. Treiman and A. Zee), *Phys. Rev. Lett.* **34**, 52 (1975). DOI: 10.1103/PhysRevLett.34.52 [PDF](#)
12. Weak Decays of Charmed Hadrons (with R.L. Kingsley, S.B. Treiman and A. Zee), *Phys. Rev. D* **11**, 1919 (1975). DOI: 10.1103/PhysRevD.11.1919 [PDF](#)
13. Weak Decays of Charmed Hadrons, II: Soft Meson Theorems (with R.L. Kingsley, S. Treiman and A. Zee), *Phys. Rev. D* **12**, 106 (1975). DOI: 10.1103/PhysRevD.12.106 [PDF](#)
14. Possible Degeneracy of Heavy Quarks, *Phys. Lett.* **59B**, 179 (1975). DOI: 10.1016/0370-2693(75)90697-8 [PDF](#)
15. Weak Interactions with New Quarks and Right-Handed Currents (with R.L. Kingsley, S.B. Treiman and A. Zee), *Phys. Rev. D* **12**, 2768 (1975). DOI: 10.1103/PhysRevD.12.2768 [PDF](#)
16. Weak Interactions of Heavy Quarks (with R.L. Kingsley and A. Zee), *Phys. Lett.* **61B**, 259 (1976). DOI: 10.1016/0370-2693(76)90144-1 [PDF](#)
17. New Leptons and Old Lepton Numbers (with A. Zee), *Nucl. Phys.* **B106**, 461 (1976). DOI: 10.1016/0550-3213(76)90390-4 [PDF](#)
18. Non-Uniqueness of Gauge Field Potentials (with S. Deser), *Phys. Lett.* **65B**, 391 (1976). [PDF](#)
19. Inequivalent Embeddings of SU (2) and Instanton Interactions, *Phys. Lett.* **65B**, 160 (1976). [PDF](#)
20. Rare Muon Decays, Natural Lepton Models, and Doubly Charged Leptons (with A. Zee), *Phys. Rev. Lett.* **38**, 531 (1977). [PDF](#)
21. Mass Corrections in Deep-Inelastic Scattering (with D. Gross and S. Treiman), *Phys. Rev. D* **15**, 2486 (1977). [PDF](#)
22. $\Delta I = \frac{1}{2}$ Rule and Right-Handed Currents: Heavy-Quark Expansion and Limitations in Zweig's Rule (with A. Zee), *Phys. Rev. D* **15**, 2660 (1977). [PDF](#)
23. A Model for Weak Trimuon Production (with A. Zee and S. Treiman), *Phys. Lett.* **68B**, 369 (1977). [PDF](#)
24. Orientation of the Weak Interaction with Respect to the Strong Interaction (with A. Zee), *Phys. Rev. D* **15**, 3701 (1977). [PDF](#)
25. Rare Muon Decays, Heavy Leptons and CP Violations (with S. Treiman and A. Zee), *Phys.*

- Rev. D **16**, 152 (1977). [PDF](#)
26. Geometry and Interaction of Instantons, *Quark Confinement and Field Theory: Proceedings of a Conference at the University of Rochester, Rochester, NY, June 14-18, 1976*, Stump and Weingarten, eds. (Wiley-Interscience, NY, 1977), pp. 211-219.
 27. Possible New Species of Quarks and Hadrons (with A. Zee), *Phys. Rev. D* **16**, 860 (1977). [PDF](#)
 28. Asymptotic Freedom: A Status Report, *Proceedings of Brookhaven APS Meeting, Brookhaven National Lab., Upton, NY*, pp.C79-C87.
 29. Sum Rules for Spin-Dependent Electroproduction - Test of Relativistic Constituent Quarks (with S. Wandzura), *Phys. Lett.* **B72**, 195 (1977). [PDF](#)
 30. Decay of Heavy Vector Mesons into Higgs Particles, *Phys. Rev. Lett.* **39**, 1304 (1977). [PDF](#)
 31. Discrete Flavor Symmetries and a Formula for the Cabibbo Angle (with A. Zee), *Phys. Lett.* **B70**, 418 (1977). [PDF](#)
 32. Instantons and Spin Forces Between Massive Quarks (with A. Zee), *Phys. Rev. Lett.* **40**, 83 (1977). [PDF](#)
 33. Problems of Strong P and T Invariance in the Presence of Instantons, *Phys. Rev. Lett.* **40**, 279 (1977). [PDF](#)
 34. Some Problems in Gauge Field Theories, *The Unification of Elementary Forces and Gauge Theories: Proceedings of the Ben Lee Memorial International Conference on Parity Nonconservation, Weak Neutral Currents and Gauge Theories*, Fermi National Accelerator Laboratory, Batavia, 1977 (N.Y., Harwood Academic Press, 1978) pp. 607-621. [PDF](#)
 35. Axion Emission in Decay of Nuclear Excited States (with S. Treiman), *Phys. Lett.* **B74**, 381 (1978). [PDF](#)
 36. Low Energy Manifestations of Heavy Particles: Application to Neutral Current (with J. Collins and A. Zee), *Phys. Rev. D* **18**, 242 (1978). [PDF](#)
 37. Effect of Instantons on the Heavy Quark Potential (with C. Callan, R. Dashen, D. Gross and A. Zee). *Phys. Rev. D* **18**, 4684 (1978). [PDF](#)
 38. Steps Toward the Heavy Quark Potential, "50 Years of the Dirac Equation," published in *AIP Conference Proceedings*, (APS Press), (48), pp. 30-37, (1979). [PDF](#)
 39. Matter-Antimatter Accounting, Thermodynamics, and Black Hole Radiation (with D. Toussaint, S. Treiman and A. Zee), *Phys. Rev. D* **19**, 1036 (1979). [PDF](#)
 40. Elementary Examples of Baryon Number Generation (with D. Toussaint), *Phys. Lett.* **B81**, 238 (1979). [PDF](#)
 41. Horizontal Interactions and Weak Mixing Angles (with A. Zee), *Phys. Rev. Lett.* **42**, 421 (1979). [PDF](#)
 42. Light Quark Masses and Isospin Violation (with D. Gross and S. Treiman), *Phys. Rev. D* **19**, 2188 (1979). [PDF](#)
 43. SU(3) Predictions for Charmed Meson Decays (with S. Treiman), *Phys. Rev. Lett.* **43**, 816 (1979). [PDF](#)
 44. Interference Effects in Charmed Meson Decays (with S. Treiman), *Phys. Rev. Lett.* **43**, 1059 (1979). [PDF](#)
 45. Operator Analysis of Nucleon Decay (with A. Zee), *Phys. Rev. Lett.* **43**, 1571 (1979). [PDF](#)
 46. Unification of Fundamental Forces, *Proceedings of Lepton and Photon Interactions at High Energies Conference*, (9th) eds. Kirk and Abarbanel, pp. 437-445, (Batavia, IL 1979). [PDF](#)
 47. Conservation or Violation of B - L in Proton Decay (with A. Zee), *Phys. Lett.* **B88**, 311 (1979). [PDF](#)
 48. Possibility and Consequences of T Violation in Nucleon Decay (with Anya Hurlbert), *Phys. Lett.* **B93**, 274 (1980). [PDF](#)
 49. Symmetry Relations in Nucleon Decay (with Anya Hurlbert), *Phys. Lett.* **B92**, 95 (1980). [PDF](#)
 50. Thermalization of Baryon Asymmetry (with S. Treiman), *Phys. Lett.* **B95**, 222 (1980). [PDF](#)
 51. Hyperweak Interactions, *Proceedings: "Particles and Fields" Conference*, Montreal; APS Press (1980). [PDF](#)

52. Cosmic Asymmetry Between Matter and Antimatter, *Scientific American*, December 1980, p.82. [PDF](#)
53. Constraints on Neutrinos (with D. Toussaint), *Nature* **289**, 777 (1981). [PDF](#)
54. Price of Fractional Charge in Unified Theories (with L.F. Li), *Phys. Lett.* **B107**, 64 (1981). [PDF](#)
55. Families from Spinors (with A. Zee), *Phys. Rev. D* **25**, 553 (1982). [PDF](#)
56. Supersymmetry and the Scale of Unification (with S. Dimopoulos and S. Raby), *Phys. Rev. D* **24**, 1681 (1981). [PDF](#)
57. Fractional Charge on Solitons (with J. Goldstone), *Phys. Rev. Lett.* **47**, 986 (1981). [PDF](#)
58. Supersymmetric Unified Models (with S. Dimopoulos), in *The Unity of the Fundamental Interactions*, ed. A. Zichichi (Plenum, New York, 1983).
59. Physical Processes Involving Majorana Neutrinos (with L.F. Li), *Phys. Rev. D* **25**, 143 (1982). [PDF](#)
60. *Prospects at Higher Energy*, Isabelle Summer Study, 1981 (BNL Press, 1981). [PDF](#)
61. Coming Attractions in SUMS and Cosmology, *Comments on Nuclear and Particle Physics* X175, (1981). [PDF](#)
62. Erice Lectures on Cosmology, in *The Unity of the Fundamental Interactions*, ed. A. Zichichi (Plenum, New York, 1983). [PDF](#)
63. Naturality Problems, *APS Particles and Fields*, Santa Cruz, (1981), (APS Press). [PDF](#)
64. Magnetic Flux, Angular Momentum, and Statistics, *Phys. Rev. Lett.* **48**, 1144 (1982). [PDF](#)
65. Remarks on Dyons, *Phys. Rev. Lett.* **48**, 1146 (1982). [PDF](#)
66. Proton Decay in Supersymmetry Theories (with S. Dimopoulos and S. Raby), *Phys. Lett.* **B112**, 133 (1982). [PDF](#)
67. Old and New Relics in Cosmology, *Proceedings NAS* **79**, 33376 (1982). [PDF](#)
68. QCD - The Modern Theory of Strong Interactions, *Ann. Rev. Nucl. Sci.* **V32**, 177 (1982). [PDF](#)
69. *Microphysical Cosmology*, (in preparation, for Princeton University Press) [abandoned]
70. Some Recent Ideas Related to Supersymmetry, *Unified Theories and their Experimental Tests*, CLEUP, Padova, (1983). [PDF](#)
71. Reheating an Inflationary Universe (with A. Aubrecht, P. Steinhart and M. Turner) *Phys. Rev. Lett.* **48**, 1437 (1982). [PDF](#)
72. Might Our Vacuum be Metastable? (with M. Turner), *Nature* **298**, 633 (1982). [PDF](#)
73. Monopole-Flux Tube Repulsion in Strong Coupling (with R. Zacher), *Phys. Rev. D* **26**, 3685 (1982). [PDF](#)
74. Boundness from below of the SU (5) Higgs Potential (with R. MacKenzie), *Phys. Rev. D* **26**, 3679 (1982). [PDF](#)
75. Magnetic Monopoles: A Local Source? (with S. Dimopoulos, S. Glashow and E. Purcell), *Nature* **298**, 824 (1982). [PDF](#)
76. Quantum Mechanics of Fractional Spin Particles, *Phys. Rev. Lett.* **49**, 957 (1982). [PDF](#)
77. Catalyzed Nucleon Decay in Neutron Stars (with S. Dimopoulos and J. Preskill), *Phys. Lett.* **B119**, 320 (1982). [PDF](#)
78. Cosmology of Invisible Axions (with J. Preskill and M. Wise), *Phys. Lett.* **B120**, 127 (1983). [PDF](#)
79. Axions and Family Symmetry Breaking, *Phys. Rev. Lett.* **49**, 1549 (1982). [PDF](#)
80. Particle Physics and Cosmology: Foundations and Working Pictures, in *The Very Early Universe*, eds. Gibbons, Hawking, Siklos. p. 2 (Cambridge University Press, 1983). [PDF](#)
81. Fun with Monopoles and Axions, in *The Very Early Universe*, eds. Gibbons, Hawking, Siklos p. 383-392 (Cambridge University Press, 1983). [PDF](#)
82. Conference Summary, in *The Very Early Universe*, eds. Gibbons, Hawking, Siklos. P. 484 (Cambridge University Press, 1983).

83. Review of “Quantum Physics” by J. Glimm and A. Jaffe, *Phys. Today*, October 1982. [PDF](#)
84. Peculiar Quantum Numbers (in preparation, for Cambridge University Press) [abandoned]
85. Family Symmetries, *AIP Conference Proceedings No. 102*, p. 68, (AIP Press, 1983). [PDF](#)
86. Thoughts on Family Symmetries, *AIP Conference Proceedings No. 96* (AIP Press, 1982). [PDF](#)
87. Microphysical Cosmology, XVIII Solvay Conference, *Phys. Reports* **C104**, 143 (1984). [PDF](#)
88. Formation of Structure in an Axion-Dominated Universe (with M. Turner and A. Zee), *Phys. Lett.* **B125**, 35, 519(E) (1983). [PDF](#)
89. Particle-Antiparticle Annihilation in Diffuse Motion (with D. Toussaint), *Jour. Chem. Phys.* **78**, 2642 (1983).
90. Linking Numbers, Spin, and Statistics of Solitons (with A. Zee), *Phys. Rev. Lett.* **51**, 2250 (1983). [PDF](#)
91. Remarks on the Chiral Phase Transition in Chromodynamics (with R. Pisarski), *Phys. Rev. D* **29**, 338 (1984). [PDF](#)
92. New Macroscopic Forces? (with J.E. Moody), *Phys. Rev. D* **30**, 130 (1984). [PDF](#)
93. The U(1) Problem: Instanton, Axions, and Familons, in *How Far Are We from the Gauge Forces?* ed. A. Zichichi (Plenum, 1985).
94. Statistical Mechanics of Anyons (with D. Arovas, J.R. Schrieffer and A. Zee), *Nucl. Phys.* **B251** [FS13], 917 (1985). [PDF](#)
95. Solitons in Superfluid $^3\text{He-A}$: Bound States on Domain Walls (with J.L. Ho, J.R. Fulco and J.R. Schrieffer), *Phys. Rev. Lett.* **52**, 1524 (1984). [PDF](#)
96. Reflections on Mirror Fermions (with G. Senjanovic and A. Zee), *Phys. Lett.* **B141**, 389 (1984). [PDF](#)
97. Illustrations of Vacuum Polarization by Solitons (with R. MacKenzie), *Phys. Rev. D* **30**, 2194 (1984). [PDF](#)
98. Examples of Vacuum Polarization by Solitons (with R. MacKenzie), *Phys. Rev. D* **30**, 2260 (1984). [PDF](#)
99. Appearance of Gauge Structures in Simple Dynamical Systems (with A. Zee), *Phys. Rev. Lett.* **52**, 2111 (1984). [PDF](#)
100. Fractional Statistics and the Quantum Hall Effect (with D. Arovas and J.R. Schrieffer), *Phys. Rev. Lett.* **53**, 722 (1984). [PDF](#)
101. A Stellar Loss Mechanism Involving Axions (with L. Krauss and J. Moody), *Phys. Lett.* **B144**, 391 (1984). [PDF](#)
102. Possible Form of Vacuum Deformation by Heavy Particles (with R. MacKenzie and A. Zee), *Phys. Rev. Lett.* **53**, 2203 (1983). [PDF](#)
103. Possible Interpretation of a New Resonance at 8.3 GeV (with K. Lane and S. Meshkov), *Phys. Rev. Lett.* **53**, 1718 (1984). [PDF](#)
104. Adiabatic Methods in Field Theory, in *TASI Lectures in Elementary Particle Physics*, ed. Williams (TASI Publications, Ann Arbor, MI, 1984, 520-535). [PDF](#)
105. Inhomogeneous Cosmology and Microphysics, in *TASI Lectures in Elementary Particle Physics*, ed. Williams (TASI Publications, Ann Arbor, MI, 1984).
106. Bolometric Detection of Neutrinos (with B. Cabrera and L. Krauss), *Phys. Rev. Lett.* **55**, 25 (1985). [PDF](#)
107. Solar Neutrino Oscillations (with L. Krauss), *Phys. Rev. Lett.* **55**, 122 (1985). [PDF](#)
108. Fundamental Physics, Mathematics, and Astronomy, in *Emerging Syntheses in Science*, ed. Pines (Santa Fe Institute, 1985). [PDF](#)
109. Solar System Constraints and Signatures for Dark Matter Candidates (with L. Krauss and M. Srednicki), *Phys. Rev. D* **33**, 2079 (1986). [PDF](#)
110. Calculations for Cosmic Axion Detection (with L. Krauss, J. Moody and D. Morris), *Phys. Rev. Lett.* **55**, 1797 (1985). [PDF](#)
111. Resonant Production and Charm Showers in Ultra-High Energy Neutrino Interactions, *Phys. Rev. Lett.* **55**, 1252 (1985). [PDF](#)
112. Simple Realizations of Magnetic Monopole Gauge Fields: Diatoms and Spin Precession (with J. Moody and A. Shapere), *Phys. Rev. Lett.* **56**, 893 (1986). [PDF](#)
113. A Short-Lived Axion Variant (with L. Krauss), *Phys. Lett.* **B173**, 189 (1986). [PDF](#)

114. Macroscopic T -Violation: Prospects for a New Experiment (with W. Bialek and J. Moody), *Phys. Rev. Lett.* **56**, 1623 (1986). [PDF](#)
115. *Longing for the Harmonies*, [a book] W.W. Norton (January, 1988).
116. "Virtual Particles" [a sonnet] Norton Anthology of Light Verse, ed. Baker, 1986.
117. Artificial Vacuum for T -Violation Experiment (with C. Pryor), *Phys. Lett.* **B194**, 137 (1987). [PDF](#)
118. New Quarks and Neutrino Counting Below the Z Threshold (with L. Krauss), *Phys. Lett.* **B181**, 380 (1986). [PDF](#)
119. Compactification of the Twisted Heterotic String (with V. Nair, A. Shapere and A. Strominger), *Nucl. Phys.* **B287**, 402 (1987). [PDF](#)
120. Geometry of Self Propulsion at Low Reynolds Number (with A. Shapere), *Jour. Fluid Mech.* **198**, 557 (1989). [PDF](#)
121. Internal Representations for Associative Memory (with E. Baum and J. Moody), NSF-ITP-86-138, *Biol. Cybernetics* **59**, 217 (1988).
122. Two Applications of Axion Electrodynamics, *Phys. Rev. Lett.* **58**, 1799 (1987). [PDF](#)
123. Efficiencies of Self-Propulsion at Low Reynolds Number (with A. Shapere), *Jour. Fluid Mech.* **198**, 587 (1989). [PDF](#)
124. Self-Propulsion at Low Reynolds Number (with A. Shapere), *Phys. Rev. Lett.* **58**, 2051 (1987). [PDF](#)
125. Lattice Fermions, *Phys. Rev. Lett.* **59**, 2397 (1987). [PDF](#)
126. Supervised Learning of Probability Distributions by Neutral Networks (with E. Baum), *Neural Information Processing*, ed. D. Anderson, *AIP Press*, 52-61 (1988). [PDF](#)
127. A Modern Look at Newton's Final Queries in *Action and Reaction: Proceedings of a Symposium to Commemorate the Tercentary of Newton's Principia* ed. P. Theerman, A. Seeff (*University of Delaware Press, 1993*) (Book). [PDF](#)
128. Gauge Kinematics of Deformable Bodies (with A. Shapere), *Am. J. Phys.* **57**, 514 (1989). [PDF](#)
129. Peculiar Spin and Statistics in 2+1 Dimensions (with R. MacKenzie), *Int. J. Mod. Phys.* **A3**, 2827 (1988). [PDF](#)
130. Geometric Phases in Physics (a text and reprint volume, edited with A. Shapere) (World Scientific, 1989). [PDF](#)
131. Self-Dual Models with θ Terms (with A. Shapere), *Nucl. Phys. B* **320**, 669 (1989). [PDF](#)
132. Field Corrections to Induced Statistics (with A. Goldhaber, R. MacKenzie), *Mod. Phys. Lett.* **A4**, 21 (1989). [PDF](#)
133. Possible New Form of Spontaneous T Violation (with J. March-Russell), *Phys. Rev. Lett.* **61**, 2066 (1988). [PDF](#)
134. Induced Quantum Numbers in Some 2 + 1 Dimensional Models (with Y.-H. Chen), *Int. J. Mod. Phys. B* **3**, 1 (1989), Abstract: *Int. J. Mod. Phys.* **A4**, 493 (1989). [PDF](#)
135. Aharonov-Bohm Interaction of Cosmic Strings with Matter (with M. G. Alford), *Phys. Rev. Lett.* **62**, 1071 (1989). [PDF](#)
136. Chiral Spin States and Superconductivity (with X.G. Wen, A. Zee), *Phys. Rev.* **B39**, 11413 (1989). [PDF](#)
137. Discrete Gauge Symmetry in Continuum Theories (with L.M. Krauss), *Phys. Rev. Lett.* **62**, 1221 (1989). [PDF](#)
138. Gauge Theory of Deformable Bodies, in *Proceedings of IUPAM Swansea Conference*, pp. 220-233 ed. B. Simon A. Truman and I.M. Davies (Adam Hilger, Bristol and NY, 1989). [PDF](#)
139. Gauge Theories of Swimming, *Phys. World* **2**, **36** (1989). [PDF](#)
140. Adiabatic Effective Lagrangians (with J. Moody and A. Shapere), in *Geometric Phases in Physics*, by A. Shapere and F. Wilczek (World Scientific, Singapore, 1989). [PDF](#)
141. Enhanced Baryon Number Violation Around Cosmic Strings (with M. Alford and J. March-Russell), *Nucl. Phys.* **B328**, 140 (1989). [PDF](#)
142. On Anyon Superconductivity, (with Y-H. Chen, E. Witten and B. Halperin), *Int'l. Jour. Mod. Phys.* **B3**, 1001 (1989). <https://doi.org/10.1142/S0217979289000725>. [PDF](#)
143. Hydrodynamic Relations in Superconductivity, (with M. Greiter and E. Witten), *Mod. Phys. Lett.* **B3**, 903 (1989). [PDF](#)
144. Consequences of Time-Reversal-Symmetry Violation in Models of High T_c Superconductors,

- (with B.I. Halperin and J. March-Russell), *Phys. Rev.* **B40**, 8726 (1989). [PDF](#)
145. Lectures on Fractional Statistics and Anyon Superconductivity, in *Anomalies, Phases, Defects* ed. M. Bregola, G. Marmo and G. Morandi (Bibliopolis, 1989). [PDF](#)
 146. Discrete Quantum Hair on Black Holes and the Nonabelian Aharonov-Bohm Effect, (with M. Alford and J. March-Russell), *Nucl. Phys.* **B337**, 695 (1990). [PDF](#)
 147. The Interactions and Excitations of Nonabelian Vortices (with M. Alford, K. Benson, S. Coleman and J. March-Russell), *Phys. Rev. Lett.* **64**, 1632 (1990). [PDF](#)
 148. Spontaneous Fact Violation (with S. Giddings), *Int. J. Mod. Phys.* **A5**, 635 (1990). [PDF](#)
 149. Space-Time Approach to Holonomy Scattering (with Y.-S. Wu), *Phys. Rev. Lett.* **65**, 13 (1990). [PDF](#)
 150. Zero Modes of Non-Abelian Vortices (with M. Alford K. Benson, S. Coleman, and J. March-Russell), *Nucl. Phys.* **B349**, 414 (1991). [PDF](#)
 151. Infrared Behavior at Negative Curvature (with C. Callan), *Nucl. Phys.* **B340**, 366 (1990). [PDF](#)
 152. Some Global Problems in Gauge Theories (Variations on a Theme of Aharonov and Bohm), in *Quantum Coherence*, ISBN #9789814439251, pp. 1-17 (World Scientific, 1990). [PDF](#)
 153. Heuristic Principle for Quantized Hall States (with M. Greiter), *Mod. Phys. Lett.* **B4**, 1063 (1990). [90/35] DOI: [10.1142/S0217984990001331](https://doi.org/10.1142/S0217984990001331). [PDF](#)
 154. States of Anyon Matter, *Int'l. Jour. of Mod. Phys.* **B5**, 1273 (1991). [90/29] DOI: [10.1142/S0217979291000626](https://doi.org/10.1142/S0217979291000626). [PDF](#)
 155. Fractional Statistics and Anyon Superconductivity, a monograph and reprint collection, World Scientific (September, 1990).
 156. Anomalous Dimensions of Anisotropic Gauge Theory Operators (with D. Robertson), *Phys. Lett.* **B251**, 434 (1990). [PDF](#)
 157. Positron Line Radiation as a Signature of Particle Dark Matter in the Halo (with M.S. Turner), *Phys. Rev. D* **42**, 1001 (1990). [PDF](#)
 158. Perspectives on Particle Physics and Cosmology, *Physica Scripta T36*, 281 (1991), invited talk at Nobel Symposium #79: "The Birth and Early Evolution of Our Universe," Gräfväallen, Östersund, Sweden, 6/90. [90/64] [PDF](#)
 159. Inflationary Axion Cosmology (with M.S. Turner), *Phys. Rev. Lett.* **66**, 5 (1991). [PDF](#)
 160. Fractional Quantum Numbers: A Conceptual Introduction, *Trends in Theoretical Physics*, Vol. 2, P. Ellis, Y. Tang, eds. (Addison-Wesley, 1991). [90/74]. [PDF](#)
 161. Relic Gravitational Waves and Extended Inflation (with M.S. Turner), *Phys. Rev. Lett.* **65**, 3080 (1990). [PDF](#)
 162. Anyons for Anyone, *Phys. World* **4**, **40** (1990). [PDF](#)
 163. Cosmological Implications of Axinos (with K. Rajagopal and M.S. Turner), *Nucl. Phys.* **B358**, 447 (1991). [90/79] [PDF](#)
 164. Anyons, *Scientific American* **264**, #5, p. 58 (May, 1991). [PDF](#)
 165. Cosmology and Broken Discrete Symmetry (with S. Trivedi, J. Preskill and M.B. Wise), *Nucl. Phys.* **B363**, 207 (1991). [91/11] [PDF](#)
 166. Dynamical Effect of Quantum Hair (with S. Coleman and J. Preskill), *Int'l. Jour. Mod. Phys. Lett.* **A6**, 1631 (1991). [91/17] [PDF](#)
 167. Paired Hall State at Half Filling (with M. Greiter and X.G. Wen), *Phys. Rev. Lett.* **66**, 3205 (1991) [91/18] [PDF](#)
 168. Growing Hair on Black Holes (with J. Preskill and S. Coleman), *Phys. Rev. Lett.* **67**, 1975 (1991). [91/32] [PDF](#)
 169. Dual Dilaton Dyons (with A. Shapere and S. Trivedi), *Mod. Phys. Lett.* **A6**, 2677 (1991). [91/33] [PDF](#)
 170. Limitations on the Statistical Description of Black Holes (with P. Schwarz, A. Shapere and S. Trivedi), *Mod. Phys. Lett.* **A6**, 2353 (1991). [91/34] [PDF](#)
 171. Exact solutions and the adiabatic heuristic for quantum Hall states (with M. Greiter), *Nucl. Phys.* **B370**, 577 (1992). [91/45] [PDF](#)
 172. Unification of Couplings, (with S. Dimopoulos and S. Raby), *Physics Today* **44**, October 1991, p.25. [91/63] [PDF](#)

173. Quantum Hair on Black Holes (with S. Coleman and J. Preskill), *Nucl. Phys.* **B378**, 175 (1992). hep-th/9201059 [91/64] [PDF](#)
174. Paired Hall States (with M. Greiter and X.G. Wen), *Nucl. Phys.* **B374**, 567 (1992). [91/66] [PDF](#)
175. Review of “Niels Bohr’s Times,” *Science* **225**, 345, (1991). [91/78] [PDF](#)
176. Disassembling Anyons, *Phys. Rev. Lett.* **69**, 132 (1992). [91/70] [PDF](#)
177. Black Holes as Elementary Particles (with C.F.E. Holzhey), *Nucl. Phys.* **B380**, 447 (1992). hep-th/9202014 [91/71] [PDF](#)
178. Internal Frame Dragging and a Global Analogue of the Aharonov-Bohm Effect (with J. March-Russell and J. Preskill), *Phys. Rev. Lett.* **68**, 2567 (1992). hep-th/9112054 [91/92] [PDF](#)
179. Quantum Mechanics, article in *World Book Encyclopedia*. [92/2]. [PDF](#)
180. Paired Hall States in Double Layer Electron Systems (with M. Greiter and X.G. Wen), *Phys. Rev.* **B46**, 9586, (1992). [92/1] [PDF](#)
181. Application of the Renormalization Group to a Second Order QCD Phase Transition, *Int. Jour. Mod. Phys.* **A7**, 3911 (1992). [91/65] [PDF](#)
182. Remarks on the Phase Transition in QCD, in *Proceedings of the IFT Conference on Dark Matter*, *Int. J. Mod. Phys. D*, **03**, 63 (1994). [PDF](#)
183. QCD and Asymptotic Freedom: Perspectives and Prospects *Proceedings of Aachen “20 Years of QCD” Conference*, ed. P. Zerwas and H. Kastrup, pp. 16-39 (World Scientific, Singapore), June 1992 and *Int’l Jour. Mod. Phys.* **A8** 1359 (1993). hep-ph/9211290 [92/79] [PDF](#)
184. The End of Physics?, *Discover* March 1993, 30. [PDF](#)
185. Quantum Purity at a Small Price: Easing a Black Hole Paradox, *Proceedings of Houston Conference on Black Holes*, ed. S. Kalara and D. Nanopoulos, pp. 1-21 January 1992, (World Scientific, Singapore). hep-th/9302096 [93/12] [PDF](#)
186. Static and Dynamic Critical Phenomena at a Second Order QCD Phase Transition (with Krishna Rajagopal) *Nucl. Phys.* **B399** 395 (1993). hep-ph/9210253 [92/60] [PDF](#)
187. Lectures (1-4) on Black Hole Quantum Mechanics, *The Black Hole 25 Years After*, eds. C. Teitelboim and J. Zanelli, *World Scientific*, pp. **336** (June 1998). [PDF](#)
188. A Philosopher in Spite of Himself (Review of *Dreams of a Final Theory*, S. Weinberg) *Physics Today*, April 1993. [PDF](#)
189. Emergence of Coherent Long Wavelength Oscillations After a Quench: Application to QCD, (with Krishna Rajagopal), *Nucl. Phys.* **B404** 577 (1993). hep-ph/9303281 [93/16] [PDF](#)
190. Beyond the Standard Model, *Proceeding of Texas/PASCOS 1992*, Berkeley, November 1992, *Annals of NYAS* **V688**, pp. 94-112 (1993). hep-ph/9304318 [93/23] [PDF](#)
191. Liberating Exotic Slaves, in *Quantum Coherence and Reality* Proceedings of Aharonov’s 60th Birthday, ed. J. Anandan, J. Safko (World Scientific, Singapore, 1995). cond-mat/9408100 [94/58] [PDF](#)
192. Fractional Statistics and Spin Charge Separation in 2+1 Dimensions (with M. Greiter and Z. Zhou). (unpublished)
193. 10^{12} Degrees in the Shade (preprinted as “Hot Stuff: The High Temperature Frontier”), *The Sciences*, January/February 1994, 22. [93/50] [PDF](#)
194. Geometric and Renormalized Entropy in Conformal Field Theory, (with C. Holzhey and F. Larsen), *Nucl. Phys.* **B424** 443 (1994). hep-th/9403108 [93/88] [PDF](#)
195. Remarks on Hot QCD, in Proceedings of Quark Matter ‘93, Borlange, Sweden, June 1993 and *Nucl. Phys.* **A566** 123c (1994). hep-ph/9308341 [93/48] [PDF](#)
196. Status of QCD, Proceeding of Lepton-Photon Conference, ed. P. Drell and D. Rubib, pp. 593-619, Cornell University, Ithaca, NY, August 1993, (*AIP Press*). hep-ph/9311302 [93/69] [PDF](#)
197. Non-Fermi Liquid Fixed Point in 2+1 Dimensions, (with Chetan Nayak), *Nucl. Phys.* **B417**, 359 (1994). cond-mat/9312086 [93/89] [PDF](#)
198. On Geometric Entropy, (with Curtis Callan), *Phys. Lett.* **B333**, 55-61 (1994). hep-th/9401072 [93/87] [PDF](#)
199. Exclusion Statistics: Low Temperature Properties, Fluctuations, Duality, Applications, (with C. Nayak), *Phys. Rev. Lett.* **73**, 2740 (1994). cond-mat/9405017 [94/25] [PDF](#)
200. Renormalization Group Approach to Low Temperature Properties of a Non-Fermi Liquid Metal,

- (with C. Nayak), *Nucl. Phys.* **B430**, 534 (1994). cond-mat/9408016 [94/59] [PDF](#)
201. Statistical Transmutation and Phases of Two-Dimensional Quantum Matter, in Proceedings of 150th Anniversary of Boltzmann's Birth, Academi Lincei, Rome. cond-mat/9509085 [95/71] [PDF](#)
 202. Some Applications of a Simple Stationary Line Element for the Schwarzschild Geometry, (with P. Kraus), *Mod. Phys. Lett.* **A9**, 3713 (1994). gr-qc/9406042 [94/46] [PDF](#)
 203. Self-Interaction Correction to Black Hole Radiance, (with P. Kraus), *Nucl. Phys.* **B433**, 403 (1995). gr-qc/9408003 [94/61] [PDF](#)
 204. Geometric Entropy, Wave Functionals, and Fermions (with F. Larsen), *Annals of Physics*, **243**, 280 (1995). hep-th/9408089 [94/51] [PDF](#)
 205. Effect of Self-Interaction on Charged Black Hole Radiance (P. Kraus), *Nucl. Phys.* **B437** 231 (1995). hep-th/9411219 [94/101] [PDF](#)
 206. A. Spin, Electron Spin, Spin and Statistics
B. Fermions and Bosons. [PDF](#)
Macmillan Encyclopedia of Physics, **1996** Edition, p. 1509-1511; 1511-1513; 1513-1514; and 547-549. [PDF](#)
 207. A. Symmetry Laws (Physics), Vol. 18, p. 89. [PDF](#)
B. Symmetry Breaking, Vol. 18, p. 86. [PDF](#)
C. Anyons, Vol. 1, p. 807. [PDF](#)
D. Geometric Phase, Vol. 8, p. 53.
E. Conservation Laws, Vol. 4, p. 368.
McGraw-Hill Encyclopedia of Science & Technology, (**8th** Edition, 1997).
 208. Review of Penrose's "Shadows of the Mind". *Science*, **266**, 1737 (1994). [PDF](#)
 209. Space-Time Aspects of Quasiparticle Propagation (with R. Levien and C. Nayak) *Int. J. of Mod. Phys.* **B9**, 3189 (1995). cond-mat/9501050 [94/108] [PDF](#)
 210. Quantum Hall States of High Symmetry (with C. Nayak), *Nucl. Phys.* **B450**, 558 (1995). cond-mat/9501052 [94/109] [PDF](#)
 211. Physical Properties of Metals from a Renormalization Group Standpoint (with C. Nayak), *International Jour. of Mod. Phys.* **B10**, 847 (1996). cond-mat/9507040 [94/60] [PDF](#)
 212. Asymptotic Freedom, Lecture on receipt of the Dirac Medal, published by *ICTP*, Trieste, Italy (1994). Princeton, N.J.: Institute for Advanced Study, 09/1996. Report no. 000067401 IASSNS-HEP 96-92 arXiv: hep-th/9609099. [PDF](#)
 213. From the Standard Model to Dark Matter, (invited talk at 5th Annual October Maryland Astrophysics Conference), published in conference proceedings, *AIP Conference Proceedings* **336**, Issue 01. hep-ph/9501343v1. [PDF](#)
 214. Realization of the Fredkin Gate Using A Series of One- And Two-body Operators, (with H.F. Chau), *Phys. Rev. Lett* **75** 748 (1995). quant-ph/9503005 [95/15] [PDF](#)
 215. Quantum Numbers of Hall Effect Skyrmions (with C. Nayak), cond-mat/9505081 [95/35] (Superseded by Quantum Numbers of Textured Hall Effect Quasiparticles, Item 222, [95-104]) [PDF](#)
 216. Indirect Neutrino Oscillations (with K.S. Babu and Jogesh Pati) *Phys. Lett.* **B359**, 351 (1995). hep-ph/9505334 [95/37] [PDF](#)
 217. Renormalization of Black Hole Entropy and of the Gravitational Coupling Constant (with F. Larsen), *Nucl. Phys.* **B458**, 249 (1996). hep-th/9506066 [95/49] [PDF](#)
 218. Spin-Singlet to Spin Polarized Phase Transition at $\nu = 2/3$: Flux-Trading in Action (with C. Nayak), *Nucl. Phys.* **B455**, 493 (1995). cond-mat/9507016 [95/59] [PDF](#)
 219. Spin-Singlet Ordering Suggested by Repulsive Interactions (with C. Nayak), cond-mat/9510132 [95/75] (See Possible Electronic Structure of Domain Walls in Mott Insulators, Item 225, [95-111]) [PDF](#)
 220. Internal Structure of Black Holes (with F. Larsen), *Phys. Lett* **B375**, 37 (1996). hep- th/9511064 [95/92] [PDF](#)
 221. Remarks on the Phase Structure of QCD, Particle Theory and Phenomenology Proceedings, Iowa State University, May 1995, ed. Lassila, et al., pg. 47, (*World Scientific*, Singapore). [95/103]

222. Quantum Numbers of Textured Hall Effect Quasiparticles (with C. Nayak), *Phys. Rev. Lett.* **77**, 4418(1996). cond-mat/9512061 [95/104] [PDF](#)
223. Aspects of d-Density Order, *Proceedings of Pacific Conference on Condensed Matter Theory: Complex Materials and Strongly Correlated Systems*, Seoul, Korea, Dec. 2-5, 1995 [95/110], cond-mat/9512156 [PDF](#)
224. QCD Interference Effects of Heavy Particles Below Threshold (with P. Kraus), *Phys. Lett.* **B382**, 262 (1996). hep-ph/9601279 [96/04] [PDF](#)
225. Possible Electronic Structure of Domain Walls in Mott Insulators (with C. Nayak), *Int. J. Mod. Phys.* **B10**, 2125 (1996). cond-mat/9602112 [95/111] [PDF](#)
226. A crack in the Standard Model?, *Nature* Vol. **380**, 19-20 (7 March 1996). [PDF](#)
227. Remarks on the Current-Carrying State of Hall Superfluids, Proceedings of 1st Jagna International Workshop on Advances in Theoretical Physics, Jagna, Bohol, Philippines, January 1995 [96/28], cond-mat/9604007 [PDF](#)
228. Classical Hair in String Theory I: General Formulation (with F. Larsen), *Nucl. Phys.* **B475**, 627 (1996). hep-th/9604134 [96/35] [PDF](#)
229. $2n$ Quasihole States Realize $2n-1$ -Dimensional Spinor Braiding Statistics in Paired Quantum Hall States (with Chetan Nayak), *Nucl. Phys.* **B479**, 529 (1996). cond-mat/9605145 [96/52] [PDF](#)
230. Experimental Consequences of a Minimal Messenger Model for Supersymmetry Breaking, (with K.S. Babu and C. Kolda), *Phys. Rev. Lett.* **77**, 3070 (1996). hep-ph/9605408 [96/55] [PDF](#)
231. Particle Physics for Cosmology, Published in “Critical Dialogues in Cosmology” in celebration of the 250th Anniversary of Princeton University, 24-27 June 1996. Ed. Neil Turok (*World Scientific*, Singapore). hep-ph/9608285 [96/79] [PDF](#)
232. Classical Hair in String Theory II: Explicit Calculations (with F. Larsen), *Nucl. Phys.* **B488**, 261 (1997). hep-th/9609084 [96-92] [PDF](#)
233. Populated Domain Walls (with C. Nayak), *Phys. Rev. Lett.*, **78**, 2465 (1997). cond-mat/9609094 [96/93] [PDF](#)
234. From Asymptotic Freedom to Unification to Supersymmetry (and Beyond), chapter in, *Physics in 2000 And Beyond* published by *World Scientific Publishing Co. (UK) Ltd.* [96-94]
235. Asymptotic Freedom, Lecture on receipt of the Dirac Medal, October 1994, published by *ICTP*, Trieste, Italy. hep-th/9609099 [96-95] [PDF](#)
236. Resolution of Cosmological Singularities (with Finn Larsen), *Phys. Rev.* **D 55**, 4591 (1997). hep-th/9610252 [96-108] [PDF](#)
237. Review of “In Search of the Ultimate Building Blocks” by G. ’tHooft, *Nature* **385**, 217 (16 Jan. 1997). [96-131] [PDF](#)
238. The Future of Particle Physics as a Natural Science, Published in “Critical Problems in Physics” in celebration of the 250th Anniversary of Princeton University, November 1996, eds. Fitch, Marlow, and Dementi, Princeton University Press; also in *Int. Jour. Mod. Phys. A* **13**, 863, (1998); also in *Magazine of Physics, Science & Ideas* **Vol. 1 No. 2** 12-25, (Dec. 1996). hep-ph/9702371 [97-11] [PDF](#)
239. The Future of Particle Physics, in Proceedings of the 11th Nishinomiya-Yukawa Memorial Symposium “Physics in the 21st Century”, ed. Kikkawa, Kunitomo, and Ohtsubo. (*World Scientific*, Singapore, 1996). [97-14]. [PDF](#)
240. Comments on the high-Q2 HERA anomaly (with Babu, Kolda, March-Russell). *Phys. Lett.* **B402**, 367 (1997). hep-ph/9703299 [97/04] [PDF](#)
241. Cross-Confinement in Multi-Chern-Simons Theories (with Lorenzo Cornalba), *Phys. Rev. Lett.* **78**, 4679 (1997). hep-th/9703131 [97/22] [PDF](#)
242. Review of “*The Inflationary Universe*” by Alan Guth, *Science* **276**, 1087 (16 May 1997). [97/43] [PDF](#)
243. Review of “*The Fabric of Reality*” by David Deutsch, *Physics World* **51**, (June 1997). [97/44] [PDF](#)
244. Mass Splittings from Symmetry Obstruction (with L. Cornalba), *Phys. Lett.* **B411**, 112-116 (1997). hep-th/9706014 [97-48] [PDF](#)

245. Some Examples in the Realization of Symmetry, *Nucl. Phys.* **B68** (Proc. Suppl.), 367 (1998). hep-th/9710135 [97/116] [PDF](#)
246. Panning for Gold at the K Stream, *Nature* **389**, 671 (16 Oct. 1997). [PDF](#)
247. An Action for Black Hole Membranes (with M. Parikh), *Phys. Rev. D* **58**, 064011, (1998). gr-qc/9712077 [97-117] [PDF](#)
248. QCD at Finite Baryon Density: Nucleon Droplets and Color Superconductivity (with M. Alford and K. Rajagopal), *Phys. Lett.* **B422**, 247-256, (1998). hep-ph/9711395 [97/119] [PDF](#)
249. A Chern-Simons Effective Field Theory for the Pfaffian Quantum Hall State (with E. Fradkin, C. Nayak, and A. Tsvelik), *Nucl. Phys.* **B516**, 704-718 (1998). cond-mat/9711087 [97-120] [PDF](#)
250. Colour Takes The Field, *Nature* **390**, 659 (18/25 Dec. 1998). [PDF](#)
251. Neutrino Deficit Challenges Conservation Laws, *Nature* **391**, 123 (8 Jan. 1998). [PDF](#)
252. Why are there Analogies between Condensed Matter and Particle Theory? *Physics Today*, **11** (Jan. 1998). [PDF](#)
253. Suggested New Modes in Supersymmetric Proton Decay (with K.S. Babu and J. Pati), *Phys. Lett.* **B423**, 337-347 (1998). hep-ph/9712307 [97/136] [PDF](#)
254. Riemann-Einstein Structure from Volume and Gauge Symmetry, *Phys. Rev. Lett.* **80**, 4851 (1998). hep-th/9801184 [97-142] [PDF](#)
255. Liberating Quarks and Gluons, *Nature*, **391**, 330-331 (22 Jan. 1998). [PDF](#)
256. Back to Basics at High Temperature, *Physics Today*, **11** (April 1998). [PDF](#)
257. Beyond The Standard Model: An Answer and Twenty Questions, in Erice 1997: highlights for subnuclear physics, 50 years later 291-327 (1997). hep-ph/9802400 [98-10] [PDF](#)
258. Color Superconductivity and Signs of Its Formation (with M. Alford and K. Rajagopal), in proceedings of Riken-BNL Workshop, November 1997. hep-ph/9802284 [98-13] [PDF](#)
259. Quantum Field Theory, in the American Physical Society Centenary issue of *Rev. Mod. Phys.* **71**, S85-S95 (1999); also in More Things in Heaven and Earth— A celebration of Physics at the Millennium ed. B. Bederson, (Springer-Verlag, New York), (1999). hep-th/9803075 [98-20] [PDF](#)
260. CP Violation, Higgs Couplings, and Supersymmetry, (with K.S. Babu, C. Kolda and J. March-Russell), *Phys. Rev. D* **59**, 016004 (1999). hep-ph/9804355 [98/30] [PDF](#)
261. Color-Flavor Locking and Chiral Symmetry Breaking in High Density QCD (with M. Alford and K. Rajagopal) *Nucl. Phys.* **B537**, 443-458 (1999). hep-ph/9804403 [98-29] [PDF](#)
262. From Notes to Chords in QCD, in proceedings of “QCD at Finite Baryon Density” Conference, April 1998, Universitaet Bielefeld, Bielefeld, Germany, *Nucl. Phys.* **A642**, 1c-13c, (1998). [98-56] [PDF](#)
263. Projective Statistics and Spinors in Hilbert Space (1998). hep-th/9806228 [98-61] [PDF](#)
264. Particle Physics: The Standard Model Transcended, *Nature* **394**, 13-15, (2 July 1998). [PDF](#)
265. Global Structure of Evaporating Black Holes (with M. Parikh), *Phys. Lett.* **B449**, 24-29 (1999). gr-qc/9807031 [98-57] [PDF](#)
266. Imaginary Chemical Potential and Finite Fermion Density on the Lattice (with M. Alford and A. Kapustin), *Phys. Rev. D* **59**, 054502 (1999). hep-lat/9807039 [98-67] [PDF](#)
267. Nuclear and Subnuclear Boiling, *Nature* **395**, 220-221 (17 September 1998). [PDF](#)
268. Beyond the standard model: *This time for real*, in *Proceedings of XVIII International Conference on Neutrino Physics and Astrophysics*, Takayama, Japan, June 4-9, 1998, *Nucl. Phys. Proc. Suppl.* **77**, 511-519 (1999). [PDF](#)
269. Fermion masses, neutrino oscillations, and proton decay in the light of SuperKamiokande (with K.S. Babu and J. Pati), *Nuclear Physics* **B566**, 33-91 (2000) hep-ph/9812538 [98-80] [PDF](#)
270. High Density Quark Matter and the Renormalization Group in QCD with two and three flavors (with T. Schäfer), *Phys. Lett.* **B450**, 325-331 (1999). hep-ph/9810509 [98-90] [PDF](#)
271. Continuity of Quark and Hadron Matter, (with Thomas Schäfer), *Phys. Rev. Lett.* **82** 3956-3959 (1999). hep-ph/9811473 [98-100] [PDF](#)
272. The Persistence of Ether, *Physics Today* **52**, 11-13 (January 1999). [PDF](#)
273. The Long Life of a Thoughtful Teacher (Review of “Geons, Black Holes and Quantum Foam: A Life in Physics” by John A. Wheeler with K. Ford) *Science* **282** (1998). [PDF](#)

274. Getting Its from Bits *Nature* **397**, 303-306 (28 Jan. 1999). [PDF](#)
275. Reply in sonnet form, to Pinotti's letter to the Editor regarding Numerical Simulation (Item 256.), 113 (March 1999). [PDF](#)
276. Quark Description of Hadronic Phases (with T. Schaefer), *Phys. Rev. D* **60**, 074014 (1999). hep-ph/9903503. [99-32] [PDF](#)
277. Cosmic Molasses for Particle Masses, *New Scientist* No **2181**, 32-37 (10 April 1999). [PDF](#)
278. Minimal Potentials with Very Many Minima (with Marin Soljatic). *Phys. Rev. Lett.* **84**, 2285- 2289 (2000) cond-mat/9904190 [99-39] [PDF](#)
279. Reaching Bottom, Laying Foundations, *Nature* "A Celebration of Physics" (special issue for American Physical Society 100th anniversary), 4-5 (April 1999). [PDF](#)
280. Superconductivity from perturbative one-gluon exchange in high density quark matter (with T. Schaefer) *Phys. Rev. D* **60**, 114033-1-114033-7 (1999). hep-ph/9906512 [99/58] [PDF](#)
281. And you're glue *Nature* **400**, 21-23 (1 July 1999). [PDF](#)
282. What QCD tells Us about Nature-and Why We Should Listen, keynote talk at PANIC'99, Uppsala, Sweden, June 10, 1999. *Nucl. Phys.* **A663 & 664**, 3c-20c (2000). hep-ph/9907340 [99-64] [PDF](#)
283. The Recent Excitement in High -Density QCD, invited talk at PANIC '99, Uppsala, Sweden, June 1999. *Nucl. Phys.* **A663 & 664**, 257c-271c, (2000). hep-ph/9908480 [99-68] [PDF](#)
284. Reply to Walter L. Wagner, regarding Mukerjee's Article on the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory ["A Little Big Bang," March 1999], Letters to the Editors, *Scientific American*, 8, July 1999. [PDF](#)
285. Hawking Radiation as Tunneling, (with M. Parikh), *Phys. Rev. Lett.* **85**, 5042-5045 (2000) hep-th/9907001 [98-22] [PDF](#)
286. Review of Speculative "Disaster Scenarios" at RHIC (with W. Busza, R. L. Jaffe and J. Sandweiss), (Report of a Committee charged by Dr. John Marburger, Director of Brookhaven National Laboratory, to review potentially catastrophic processes that might be initiated by heavy ion collisions at the Relativistic Heavy Ion Collider.) *Rev. Mod. Phys.* **72**, 1125-1140, (2000) hep-ph/9910333[99-87] [PDF](#)
287. QCD In Extreme Conditions, Lectures given at CRM Summer School, "Theoretical Physics at the End of the XXth Century," June 27-July 10, Banff (Alberta), Canada. Published in *CRM Series in Mathematical Physics*. Saint-Aubin and Vinet, eds. (Springer) 567-636 (2000) hep-ph/0003183 [99-92] [PDF](#)
288. Mass without Mass I: Most of Matter, *Physics Today*, **52** (1999). [PDF](#)
289. Maxwell's Other Demon, *Nature* **402**, 22-23,(4 November 1999). [PDF](#)
290. Charged stripes from alternating static magnetic field, (with Oleg Tchernyshyov), *Phys. Rev.* **B62**, 4208 (2000) cond-mat/9911347 [99-108] [PDF](#)
291. Mass without Mass II: The Medium is the Mass-age, *Physics Today*, **13-14** (January 2000). [PDF](#)
292. Is the Sky made from Pi? (Review of two books, "Just Six Numbers: The Deep Forces that Shape the Universe" by Martin Rees; and "The Nine Numbers of the Universe" by Michael Rowan-Robinson) *Nature* **403**, 2479-2481 (20 January 2000). [PDF](#)
293. Radical Conservatism and Nucleon Decay, Invited Lecture at NNN99 Workshop, September 23-25, 1999, at SUNY-Stony Brook, NY. Published in *AIP conference Proceedings of NNN99*, **62-73** (1999) . hep-ph/0002045 [00-99] [PDF](#)
294. Backyard Exotica, *Nature* **404**, 452-45 (30 March 2000). [PDF](#)
295. Neutralino Dark Matter in Focus Point Supersymmetry (with J.Feng and K. Matchev), *Phys. Lett.* **B482**, 388-399 (2000) hep-ph/0004043 [00-24] [PDF](#)
296. Saltatory Relaxation of the Cosmological Term in String Theory, (with J. Feng, J. March-Russell and S. Sethi). *Nucl. Phys* **B602**, 307-328 (2001) hep-th/0005276 [00-25] [PDF](#)
297. Weinberg on Supersymmetry; Another Landmark Work (Review of "The Quantum Theory of Fields, vol. 3: Supersymmetry" by Steven Weinberg) *Physics Today*, **53N555-56**, (May 2000). [PDF](#)
298. QCD Made Simple, *Physics Today*, **53N8**, 22-28, (2000) [MIT-CTP-3114] [PDF](#)
299. Prospects for Indirect Detection of Neutralino Dark Matter (with J. Feng and K. Matchev), *Phys.Rev. D* **63**, 4502-4504 (2001). astro-ph/0008115 [00-55] [MIT-CTP-3115] [PDF](#)

300. Josephson Effect Without Superconductivity: Realization in Quantum Hall Bilayers, (with M. Fogler), *Phys. Rev. Lett.* **86**, 1833-1836 (2001). cond-mat/0007403 [MIT-CTP-3116] [PDF](#)
301. The Condensed Matter Physics of QCD, (with K. Rajagopal) in “Handbook of QCD”, ed. M. Shifman, *World Scientific*, **2016-2151 (2001)**. hep-ph/0011333 [MIT-CTP-3049] [PDF](#)
302. Enforced Electrical Neutrality of the Color-Flavor Locked Phase (with K. Rajagopal), *Phys. Rev. Lett.* **86**, 3492-3495 (2001). hep-/0012039 [MIT-CTP-3055] [PDF](#)
303. Voyaging in Hilbert Space, *Fortschr Phys.* **48**, 9-11, 769-770 (2000). [MIT-CTP-3117] [PDF](#)
304. Future Summary, *Int. J. Mod. Phys. A* **16**, N10 1653-1677 (2001). [MIT-CTP -3072]; hep-ph/0101187. [PDF](#)
305. Precision Precession, *Nature* **410**, 28-29 (2001). [MIT-CTP-3118] [PDF](#)
306. When Words Fail, *Nature* **410**, 149 (2001) [MIT-CTP-3119] [PDF](#)
307. The Dirac Equation, in “It Must Be Beautiful: The Great Equations of Modern Science” ed. G. Farmelo (Granta Books, 2002) 102-130. Also in *Int. J. Mod. Phys. A* **19** S1 45-74 (2004). [MIT-CTP- 3120] [PDF](#)
308. Learning From QCD, Proceedings: EPIC 2000 workshop *AIP Conference* **588**, 13-33 [MIT-CTP-3121] [PDF](#)
309. Observability of Earth-Skimming Ultra-High Energy Neutrinos (with J. Feng, P. Fisher, and T. Yu) *Phys. Rev. Lett.* **88**, 161102 (2001). hep-ph/0105067 [MIT-CTP-3122] [PDF](#)
310. The Minimal CFL-Nuclear Interface (with M. Alford, K. Rajagopal, and S. Reddy), *Phys.Rev. D* **64**, 074017 (2001) hep-ph/0105009 [MIT-CTP-3123] [PDF](#)
311. Unified Field Theories, in “The Encyclopedia of Physical Science and Technology Vol. 17 – Third Edition” ed. R. Meyers , 339-349 (Academic Press, 2001). [MIT-CTP-3124]
312. Scaling Mount Planck 1: A View from the Bottom, *Physics Today* **54N6**, 12-13 (2001). [MIT-CTP-3125] [PDF](#)
313. Newton Rules (for now), *Nature* **410**, 881-882 (2001). [MIT-CTP-3126] [PDF](#)
314. Quantum Chromodynamics, book in preparation for Princeton University Press. [abandoned]
315. Quark-Gluon Matter, in “McGraw-Hill Yearbook of Science & Technology” 298-299 (2002). [MIT- CTP- 3160]. [PDF](#)
316. Review of “ITEP Lectures on Particle Physics and Field Theory, Vols. 1 and 2” by M. Shifman, *Physics Today* **53N8**, 46-48 (2000). [MIT-CTP-3161] [PDF](#)
317. What is Quantum Theory? *Physics Today* **53N6**, 11-12 (2000). [MIT-CTP-3159] [PDF](#)
318. Quantum Statistics, in “Macmillan Encyclopedia of Physics, Supplement: Elementary Particle Physics” (2002). [MIT-CTP-3177]. [PDF](#)
319. The World’s Numerical Recipe, *Daedalus* **131**, 142-147 (2001). [MIT-CTP-3185] [PDF](#)
320. Universality, *Nature* **415**, 265 (2001). [MIT-CTP-3186] [PDF](#)
321. Scaling Mount Planck 2: Base Camp, *Physics Today* **54N11**, 12-13 (2001). [MIT-CTP 3187] [PDF](#)
322. Particle and Astroparticle Search for Supersymmetry (with J. Feng and K. Matchev) SNOWMASS-2001-P309, (Nov. 2001). hep-ph/0111295 [MIT-CTP 3199] [PDF](#)
323. Reply to C. Alden Meade (Question of Fundamental Constants) *Physics Today*, **54N** 11-15, (2001). [PDF](#)
324. Fermi and Elucidation of Matter, in “Fermi Remembered” ed. James W. Cronin, 34-51 (University of Chicago Press 2004). [MIT-CTP 3227] [PDF](#)
325. Obituary of William Edward Caswell (with C. Callan), *Physics Today* **54N12**, 74-75 (2001). [PDF](#)
326. Four Big Questions with Pretty Good Answers, delivered at Symposium in Honor of Heisenberg’s 100th birthday, December 6, 2001. In “Fundamental Physics - Heisenberg and Beyond” ed. Gerd W. Buschhorn, Julius Wess (Springer 2004). hep-ph/0201222 [MIT-CTP-3236] [PDF](#)
327. The Social Benefit of High-Energy Physics, in *Macmillan Encyclopedia of Physics, Supplement: Elementary Particle Physics* (2002). [MIT-CTP-3237] [PDF](#)
328. Scaling Mount Planck 3: Is That All There Is? *Physics Today* **55N8**, 10-11 (2002). [MIT-CTP-3276] [PDF](#)
329. Depilating global charge from thermal black holes, John March-Russell, John et al. hep-th/0203170
CERN-TH-2001-378 [MIT-CTP-3236] [PDF](#)

330. Some Basic Aspects of Fractional Quantum Numbers, Commentary for the Volume “Selected papers of J. Robert Schrieffer” ed. N.E. Bonesteel, L.P. Gor’kov (*World Scientific*) **135-152** (2002). cond-mat/0206122 [MIT-CTP -3275] [PDF](#)
331. Interior Gap Superfluidity (W. Vincent Liu), *Phys. Rev. Lett.* **90**, 047002 (2002). cond-mat/0208052 [MIT-CTP -3279] [PDF](#)
332. QCD and Natural Philosophy, (Plenary talk at UNESCO TH2002 Conference) *Annales Henri Poincare* **4**, S211-S228, (2003). physics/0212025 [MIT-CTP-3328] [PDF](#)
333. The Future of High Energy Physics, (Summary talk at ICHEP 2002 - Rochester Conference), *Nucl. Phys* **B117**, (Proc Suppl.) 410-430 (2003). hep-ph/0212128 [MIT-CTP-3329] [PDF](#)
334. Opportunities Challenges and Fantasies in Lattice QCD, (Keynote talk at LATTICE 2002), *Nucl. Phys* **B119**, (Proc. Suppl.) 3-12 (2003). hep-lat/0212041 [MIT-CTP-3337] [PDF](#)
335. Life’s Parameters, *Physics Today*, **56N2**, 10-11 (2003). [MIT-CTP-3339] [PDF](#)
336. Inaugural Editorial Letter, *Annals of Physics* **303** (2003). [PDF](#)
337. Review of “Galileo’s Finger” by P. Atkins, *Nature* **422**, 377 (2003). [MIT-CTP-3358] [PDF](#)
338. Breached Pairing Superfluidity: Possible Realization in QCD (with E. Gubankova and W. Vincent Liu) *Phys. Rev. Lett.* **91**, 32001 (2003). hep-ph/0304016 [MIT-CTP-3357] [PDF](#)
339. Analysis and Synthesis I: What Matters for Matter, *Physics Today* **56N5**, 10-11 (2003), [MIT-CTP-3363] [PDF](#)
340. Analysis and Synthesis II: Universal Characteristics, *Physics Today* **56N**, 710-11 (2003). [MIT-CTP-3398] [PDF](#)
341. Diquarks and Exotic Spectroscopy (with R.L. Jaffe), *Phys. Rev. Lett.* **91**, 232003 (2003). hep-ph/0307341 [MIT-CTP-3401] [PDF](#)
342. The Origin of Mass, *Physics@MIT* **24-35** (2003). [MIT-CTP-3410] [PDF](#)
343. Review of “Quantum: A Guide for the Perplexed” by J. Al-Khalili, *Nature* **424**, 997-8 (2003). [MIT-CTP-3412]. [PDF](#)
344. The World’s Numerical Recipe, in *The Best American Science Writing 2003*, ed. Oliver Sacks, 96-101 (Harper-Collins 2003). [PDF](#)
345. Analysis and Synthesis III: Cosmic Groundwork, *Physics Today* **56N10**, 10-11 (2003). [MIT-CTP-3427] [PDF](#)
346. Thermal Decay of the Cosmological Constant into Black Holes (with A. Gomberoff, M. Henneaux, C. Teitelboim), *Phys. Rev. D* **69**, 083520 (2004). hep-th/0311011 [MIT-CTP- 3433] [PDF](#)
347. Spin-Orbit Ordering, Momentum Space Coexistence, and Cuprate Superconductivity (with W. Vincent Liu) (2003). cond-mat/0312685 [MIT-CTP-3436] [PDF](#)
348. Spin dependent Hubbard Model and a Quantum Phase Transition in Cold Atoms (with W. Vincent Liu and Peter Zoller), *Phys. Rev. A* **70**, 033603 (2004). cond-mat/0404478 [MIT-CTP-3437] [PDF](#)
349. Systematics of Exotic Cascade Decays (with R.L. Jaffe) *Phys. Rev. D* **69**, 114017 (2004). hep-ph/0312369, [MIT-CTP-3463] [PDF](#)
350. From Concept to Reality to Vision, (speech accepting EPS high energy physics prize), *Eur. Phys. J.* **C33**, S1-S4 (2004). hep-ph/0401035 [MIT-CTP-3460] [PDF](#)
351. A Perspective on Pentaquarks (with R.L. Jaffe) (plenary talk at EPS conference), *Eur.Phys. J.* **C33**, S38-S42 (2004). hep-ph/0401034 [MIT-CTP-3461] [PDF](#)
352. Analysis and Synthesis IV: Limits and Supplements, *Physics Today* **57N1**, 10-11 (2004). [MIT-CTP-3464] [PDF](#)
353. The Universe is a Strange Place, (keynote talk at SpacePart 03: 2nd International Conference on Particle and Fundamental Physics in Space, Washington, DC) *Nuclear Physics B Proceedings Supplements* **134**, 3-12 (2004). astro-ph/0401347 [MIT-CTP-3465] (Note: differs from 390.) [PDF](#)
354. A constructive critique of the three standard systems, in Advanced Studies Institute: Physics at LHC-Praha-2003, Prague, CR), *Czech. J. Phys.* **54**, A415-A427 (2004). hep-ph/0401126 [MIT-CTP- 3466] [PDF](#)
355. From ‘not wrong’ to (maybe) right, *Nature* **428**, 261 (2004). physics/0403115 [MIT-CTP-3480] [PDF](#)
356. Total Relativity: Mach 2004, *Physics Today* **57N4**, 10-11 (2004). [MIT-CTP 3482] [PDF](#)
357. Stability Criteria for Breached Pair Superfluidity (with Michael McNeil Forbes, Eleana

- Gubankova and W. Vincent Liu) *Phys. Rev. Lett.* **94**, 017001 (2004). hep-ph/0405059 [MIT-CTP-3491] [PDF](#)
358. Quarks, Diquarks and Pentaquarks (with R.L. Jaffe), *Physics World*, **17**, 25-30 (2004). [MIT-CTP-3492] [PDF](#)
359. Answers to “What is the physicist’s concept of symmetry?”, “Could we tell if left and right were reversed?” in Access Science @ Mc Graw-Hill, www.accessscience.com
360. Yang-Mills Theory In, Beyond, and Behind Observed Reality, in “50 years of Yang-Mills Theory” ed. G. ’t Hooft 255-69 (*World Scientific*, Singapore) (2004). hep-ph/0405147 [MIT-CTP-3493] [PDF](#)
361. A Model of Anthropic Reasoning, Addressing the Dark to Ordinary Matter Coincidence, Solicited article for “Universe or Multiverse” ed. B. Carr (Cambridge University Press) (2004). hep-ph/0408167 [MIT-CTP-3526] [PDF](#)
362. Whence the Force of $F=ma$? I: Culture Shock, *Physics Today* **57N10**, 11-12 (2004) [MIT-CTP-3527] [PDF](#)
363. Diquarks as Inspiration and as Objects, in “Kogan Memorial: From Fields to Strings” Vol. 1, ed. M. Shifman, 77-93 (World Scientific) (2004). Also in “Deserfest: A Celebration of the Life and Works of Stanley Deser” ed. J. Liu, M. Duff, K. Steele, R. Woodard, 322 (*World Scientific*) (2004). hep-ph/0409168 [MIT-CTP-3529] [PDF](#)
364. Breached Superfluidity in p-wave (with E. Gubankova and E. Mishchenko), *Phys. Review Lett.* **94**, 110402 (2005). cond-mat/0409088 [MIT-CTP-3528] [PDF](#)
365. Doing science gave me freedom, in “One Hundred Reasons To Be a Scientist”, 250-51 (40th anniversary issue, Abdus Salam international centre for theoretical physics) (2004). [MIT-CTP-3530] [PDF](#)
366. In Search of Symmetry Lost *Nature* **433**, 239-247 (2004). [MIT-CTP-3531] [PDF](#)
367. Hadron Systematics, Diquark Correlations, and Exotics (with A. Selem) (2004). [MIT-CTP-3532] [superseded by 403.]
368. Reply to letters commenting on Reference Frame article Analysis and Synthesis IV: Limits and Supplements, *Physics Today* **57N9**, 14-15 (2004). [PDF](#)
369. Whence the Force of $F=ma$? II: Rationalizations, *Physics Today* **57N12**, 10-11 (2004). [MIT-CTP-3563] [PDF](#)
370. Gapless Surfaces in Anisotropic Superfluids (with E Gubankova and E Mishchenko), *Phys. Rev. B* **74**, 184516 (2006). cond-mat/0411238 [MIT-CTP-3562] [PDF](#)
371. Whence the Force of $F=ma$? III: Cultural Diversity, *Physics Today* **58N7**, 10-11 (2004). [MIT-CTP-3590] [PDF](#)
372. A Relationship Between Hawking Radiation and Gravitational Anomalies (with S. Robinson), *Phys. Review Lett.* **95**, 011303-1 (2005). gr-qc/0503074 [MIT-CTP-3561] [PDF](#)
373. Asymptotic Freedom: From Paradox to Paradigm, (Lecture on Receipt of Nobel Prize) *Les Prix Nobel* **100-124** (Almqvist & Wiesell International, Stockholm, Sweden) (2004). hep-ph/0502113 [MIT-CTP-3605] a. Photograph *Le Prix Nobel* 96 (2004). b. *Biography Le Prix Nobel* 97-99 (2004). [PDF](#)
374. Shelf Life (Interview) *Physics World* **1747** (Nov. 2004). [PDF](#)
375. Treks of Imagination (Review of “The Road to Reality” by Roger Penrose) *Science* **307**, (2004). [PDF](#)
376. New Physical Laws Suggested by Symmetry (Lecture on receipt of King Faisal International Prize), *Articles In Medicine and Science V*, **83** (2004-2005).
377. Gravitational Correction to Running of Gauge Couplings (with S. Robinson) *Phys. Rev. Lett.* **96**, 213601 (2006). hep-th/0509050 [MIT-CTP 3617] [PDF](#)
378. The Origin of Mass World Year of Physics Essay, *Frontline* Vol. 22 (2005); also *Mod. Phys Lett. A* **21** 701-12 (2006). (Modified from 342.) [MIT-CTP 3642]
379. An emptier emptiness? *Nature* **435**, 152 (2005). [MIT-CTP 3643] [PDF](#)
380. Happy 100th Birthday, Special Relativity, (<http://www.accessscience.com>) (2005). [MIT-CTP-3656]
381. My Favorite Scientific Picture, *Science et Vie, (Science and Life)* (June 05) *Exploration*, 6, [MIT-CTP -3657]. [PDF](#)
382. Reductionism is Dead, Long Live Reductionism, (<http://www.pagewise.com>) (2005). [MIT-CTP

- 3658]
383. Asymptotic Freedom: From Paradox to Paradigm, *Rev. Modern Physics* **77**, 857 (2005); PNAS 102 N24 8403-13 (2005); *Int. J. Mod. Phys. A* 20 (2005). (See item 373.) [MIT-CTP-3659]
 384. Advantages and Distinguishing Features of Focus Point Supersymmetry (with Jonathan L. Feng) *Phys. Lett.* **B631**, 170-176 (2005). hep-ph/05007032, [MIT-CTP- 3629] [PDF](#)
 385. General Issues Connecting Flavor Symmetry and Supersymmetry (with E. Bilgin, B. Patt, D. Tucker-Smith) *Phys. Lett.* **B634**, 69-73 (2006). hep-ph/0509075, [MIT-CTP- 3682] [PDF](#)
 386. Example of a Hidden Flavor Sector (with B. Patt and D. Tucker-Smith) (2005). hep-ph/0509295 [MIT-CTP-3687] [PDF](#)
 387. Journal Club: Promise that anyon particles hold for quantum computing excites the physicist who named them *Nature* **437**, 299 (2005). [PDF](#)
 388. On Absolute Units, I: Choices, *Physics Today* **58N10**, 12-13 (2005). [MIT-CTP-3690] [PDF](#)
 389. An explorer and surveyor *Nature* **437**, 1095 (2005). (tribute to H. Weyl) [MIT-CTP 3694] [PDF](#)
 390. The Universe is a Strange Place, *Lepton-Photon Interactions at High Energies, International Symposium XXII Proceedings* 447-61; also in *Int. J. Mod. Phys. A* **21**, 8-9 (2005). physics/0511067 (2005) [MIT-CTP-3701] (Different from 353.). [PDF](#)
 391. Enlightenment, Knowledge, Ignorance, Temptation, in *Universe or Multiverse?* ed. Bernard Carr (Cambridge University Press) (2005). (Summary talk given at Conference “Expectations of a Final Theory”, Cambridge University.) hep-ph/0512187 [MIT-CTP-3709] [PDF](#)
 392. Dimensionless constants, cosmology and other dark matters (with M. Tegmark, A. Aguirre, and M. Rees), *Phys. Rev. D.* **73**, 023505 (2006). astro-ph/0511774 [MIT-CTP-3710] [PDF](#)
 393. On Absolute Units, II: Challenges and Responses, *Physics Today* **59N1**, 10-11 (2006). [MIT-CTP-3711] [PDF](#)
 394. From Electronics to Anyonics, *Physics World* **19**, 22 (2006). [MIT-CTP-3713] [PDF](#)
 395. Hawking radiation of charged blackhole through gauge and gravitational anomalies (with Satoshi Iso, Hiroshi Umetsu) *Phys. Rev. Lett.* **96**, 151302 (2006). hep-th/0602146 [MIT-CTP-3714] [PDF](#)
 396. *Fantastic Realities: 49 Mind Journeys and a trip to Stockholm* (World Scientific, Singapore) (2006).
 397. Hadron systematics and emergent diquarks (with A. Selem) in *Ringberg 2005, New trends in HERA physics*, eds. Grindhammer, Kniehl, Kramer and Ochs, *World Scientific*. ISBN #9789812773524, pp. 337-356 (2006). hep-ph/0602128 [MIT-CTP 3721] [PDF](#)
 398. Stability conditions and fermi surface topologies in a superconductor (with E. Gubankova and A. Schmitt) *Phys. Rev.* **B74**, N6 (2006). cond-mat/0603603 [MIT-CTP 3722] [PDF](#)
 399. Anomalies, Hawking radiation and regularity in rotating black holes (with S Iso, H. Umetsu) *Phys. Rev. D* 74, 044017 (2006). hep-th/0606018 [MIT-CTP 3730] [PDF](#)
 400. On Absolute Units, III: Absolutely Not, *Physics Today* 59N5, 10-11 (2006). [MIT-CTP-3742] [PDF](#)
 401. Higgs-field Portal into Hidden Sectors, (with Brian Patt) hep-ph/0605188 (2006). [MIT-CTP 3745] [PDF](#)
 402. My Favorites [Discussion of favorite books], *New York Academy of Sciences Update* 19, (May/June 2006) [PDF](#)
 403. Hadron Systematics Exposing Diquark Correlation (with A Selem) (2006). [MIT-CTP 3762]
 404. On Magic Moments, SEED (November, 2006). [MIT-CTP 3766]
 405. Archaeopteryx Looks Up. Speculations on the Future of Human Evolution, *New York Academy of Sciences Update* 20, pp. 10-13 (Sept/Oct 2006) [MIT-CTP 3767] [PDF](#)
 406. Reasonably Effective 1: Deconstructing a Miracle, *Physics Today* 59N11, 8-9 (2006). [MIT-CTP 3768] [PDF](#)
 407. Did the Big Bang Boil? *Nature* 443, 637 (2006). [MIT-CTP 3769] [PDF](#)
 408. Resonating with Feshbach, *Physics @MIT* 32-35 (2006) [MIT-CTP 3770] [PDF](#)
 409. Pappalardo Sonnet, *Physics @MIT* 25 (2006).
 410. Quantum Chromodynamics, *SciDAC Review* (Fall 2006). [MIT-CTP 3776]. [PDF](#)
 411. The Big Questions, *New Scientist*, 50th Anniversary Special 99 (November, 2006)
 412. Hard-core revelations, *Nature* **445**, 156 (2007). [MIT-CTP 3804] [PDF](#)

413. La musica del vuoto (Music of Void), *Di Renzo Editore* (2007)
414. Reasonably Effective II: Devil's Advocate, *Physics Today* **60**, N5 8-9 (2007). [MIT-CTP 3826] [PDF](#)
415. W Poszukiwaniu Harmonii *Longing for the Harmonies*, translators Lokas and Bieniok *Pr'oszyn'ski i S-kq* (2007)
416. Fundamental Constants, in "Visions of Discovery, in honor of Charles Townes' 90th Birthday" ed. R. Chiao, Part II 75-104 (2007). physics.gen-ph/0708.4361 [MIT-CTP 3847]
417. Quantum Chromodynamics: Lifestyles of the small and simple, *Nature Physics* 3, 375-6 (June, 2007). [MIT-CTP 3848] [PDF](#)
418. Physics Will Not Achieve a Theory of Everything, in "What are you Optimistic About?" ed. John Brockman (Harper Perennial 2007). [PDF](#)
419. Anticipating a New Golden Age (Invited Lecture at SUSY 07, Karlsruhe) in "SUSY 07 Proceedings: Perspectives on LHC Physics" ed. G. Kane and A. Pierce (World Scientific, July 2008); also in *Int. J. Mod. Phys. A***23**. 1791-1811 (2007); also in *European Physical Journal C* **59** **85** (2007). hep-ph/07084236 [MIT-CTP 3858] [PDF](#)
420. Big Troubles, Imagined and Real, in "Global Catastrophic Risks", ed. N. Bostrom and M. Cirkovic (Oxford University Press) 346 (July, 2008). [MIT-CTP 3863]
421. Near-Zero Modes in Superconducting Graphene, (with Pouyan Ghaemi) cond.- mat:supr-con/0709.2626; v2 (September 2011) *Phys. Scr.* **T146**, 014019 (2012) [MIT-CTP 3864]
422. My Wizard, *Physics Today* **61**, N1 (2008). [MIT-CTP 3866] [PDF](#)
423. *The Lightness of Being: Mass, Ether and the Unification of Forces* (Basic/Perseus) (August 2008)
424. Axion Cosmology and the Energy Scale of Inflation (with Mark Hertzberg and Max Tegmark) *Phys. Rev. D.* **78**, 083507 (2008). astro-ph/0807.1726 [MIT-CTP3950] [PDF](#)
425. QCD Meets BCS Meets QQ^- , in "QCD Down Under 2", p. 7. [PDF](#) [MIT-CTP 3945]
426. Forecasting the Fate of Mysteries: Our modern answer to the Pyramids, *Newsweek* (September 2008). [PDF](#)
427. The Beginning of a New Golden Age in Understanding the Laws of Nature *Po drogach uc-zonych* (Polska Akademia Umiejtnosci, Krakow 2008) 763.
428. New Kinds of Quantum Statistics, in "Spin - Poincar'e Seminar 2007" 61-69, ed. B. Duplantier, J.M. Raimond, and V. Rivasseau, (Birkhauser Verlag AG, 2009). hep-ph 0812.5097 [MIT-CTP 3997]. [PDF](#)
429. Mass by Numbers *Nature* 456, 449 (2008). [MIT-CTP 4002] [PDF](#)
430. Introduction to "Philosophy of Mathematics and Natural Science", by Hermann Weyl (Princeton University Press, 2008). [MIT-CTP 4005]
431. Running Inflation in the Standard Model (with Andrea De Simone, Mark P. Hertzberg), *Phys. Lett. B* 678, 1-8 (2009). hep-ph/0812.4946 [MIT-CTP 4008] [PDF](#)
432. "National Greatness" Versus Real National Greatness, *Science News* (October 2008). [PDF](#)
433. A Slice of Scifoo, *Edge, The Third Culture* (2008). (<https://bit.ly/2FLAPMm>).
434. Majorana Returns, *Nature Physics* **5**, 614-618 (2009). [MIT-CTP 4016] [PDF](#)
435. Journal Club: A theoretical physicist examines exotic particles lurking in new materials, *Nature* **458**, 129 (2009). [MIT-CTP 4017] [PDF](#)
436. What is Space?, *Physics @MIT* 30 (2009). [PDF](#)
437. Quantum Field Theory, in "Compendium of Quantum Physics" eds. D. Greenberger, K. Hentschel, F. Weinert (Springer, 2009). [PDF](#)
438. The Social Benefit of High-Energy Physics: Challenges, Transformations and Development, in "Transformations - Risk, Crisis, Adaptation" ed. V. I. Ionesov 102-122 (Samara, 2009).
439. Prelude to Compressed Baryonic Matter, *The CBM Physics Book* eds. B. Friman, C H"ohne, J. Knoll, S Leupold, J. Randrup, R. Rapp, and P. Senger Lecture Notes in *Physics* **814**, 1-10 (Springer, 2011). hep-ph 1001.2729 [MIT-CTP 4109] [PDF](#)

440. Some Calculable Contributions to Entanglement Entropy, (with Mark P. Hertzberg) hep-th/1007.0993 *Phys. Rev. Lett.* **106**, 050404 (2011). [MIT-CTP 4110] [PDF](#)
441. Beyond the Standard Litany: LOSP, Higgs Portal, Lattice Lattice Gauge Theory, *European Physical Society Europhysics Conference on High Energy Physics, PoS EPS HEP2009:001* (2009). hep-ph/1003.4672v2 [MIT-CTP 4133] [PDF](#)
442. The Mind’s New Eye, Project *News Syndicate* (March 2010). [PDF](#)
443. Effective Action, Boundary Conditions and Virasoro Algebra for AdS (with Achilleas P. Porfyriadis) (July 2010). gr-qc 1007.1031 [MIT-CTP 4160] [PDF](#)
444. BCS as Foundation and Inspiration: The Transmutation of Symmetry, *Mod. Phys. Lett. A* Vol. **25**, No. 3, 3169-3189 (2010); also in “BCS: 50 Years”, ed. L. Cooper and D. Feldman (World Scientific) pp. 535-558 (2010). cond-mat.supr.con 1008.1741 [MIT-CTP4173] [PDF](#)
445. A Landmark proof (Viewpoint on “Plasma analogy and non-Abelian statistics for Ising-type quantum Hall states”), *Physics* **V4**, 10 (2011). [PDF](#)
446. Introduction to “Quantum Matter” *Phys. Scr.* **T146**, 014001(2012). cond-mat.med-hall 1109.1523 [MIT-CTP 4292] [PDF](#)
447. *Quantum Beauty: Real and Ideal*, in “Beauty” ed. L. Arrington, Z. Leinhardt and P. Dawid, (Cambridge University Press) pp. 43-71 (2013). [MIT-CTP 4294] [PDF](#)
448. MIT 150 Infinite History Interview (October 2011). [MIT-CTP 4313] (<https://bit.ly/2Ia98jv>).
449. Classical Time Crystals (with A. Shapere), *Phys. Rev. Lett.* **109**, 160402 (2012). cond-mat.other 1202.2537 [MIT-CTP 4347] [PDF](#)
450. Quantum Time Crystals, *Phys Rev. Lett.* **109**, 160401 (2012) quant-ph 1202.2539 [MIT-CTP 4348] [PDF](#)
451. Hidden Layers, in “This Will Make You Smarter”, ed. John Brockman, (*Harper Perennial*, 2012). [PDF](#)
452. Newton method for stationary states (with Xiaoxi Zhang) [MIT-CTP 4352] (abandoned)
453. Introductory Remarks, in “Nobel Symposium 148: Graphene and Quantum Matter”, eds. A. Niemi, F. Wilczek, E. Ardonne, H. Hansson, *Physica Scripta*, **2012**, T146 (2012). [PDF](#)
454. Happy Birthday Electron, *Scientific American* (June 2012). [PDF](#)
455. A Long View of Particle Physics, in “The Theory of the Quantum World (Solvay Conference Proceedings)” ed. D. Gross, M. Henneaux and A. Sevrin (*World Scientific*, 2013). hep-th 1204.4683, [MIT-CTP 4358] [PDF](#)
456. Final Editorial Letter, *Annals of Physics* 327/6, **327**, 7, 1785-1932 (2012). [PDF](#)
457. Branched Quantization (with A. Shapere), *Phys. Rev. Lett.* **109**, 200402 (2012). quant-ph/1207.2677 [MIT-CTP 4381] [PDF](#)
458. Quantum physics: Majorana modes materialize, *Nature* **486**, 195-197 (June 2012). [MIT-CTP 4376] [PDF](#)
459. Origins of Mass, *Central European Journal of Physics* **D12**,00144 (June 2012) hep-ph 1206.7114 [MIT-CTP 4379] [PDF](#)
460. Foreward to “Radioactive Transformations” by Ernest Rutherford, pp. ix-xli (Yale University Press) (2012). [PDF](#)
461. Constraints on Chronologies (with Alfred Shapere), gr-qc 1208.3841 [MIT-CTP 4389] (Aug. 2012). [PDF](#)
462. Models of Topology Change (with Alfred Shapere and Zhaoxi Xiong), hep-th 1210.3545, [MIT-CTP 4397] (October 2012) [PDF](#)
463. A watershed: the emergence of QCD (with David Gross), *CERN Courier* (2013). [MIT-CTP 4435] [PDF](#)
464. The Modern Concept of Substance, *Bulletin of the American Academy of Arts and Sciences*. Bulletin Vol. LXVI/No. 2, 29-34 (Winter 2013). [MIT-CTP 4433] [PDF](#)
465. What’s Next: Follow Beauty (Viewpoint), *New Scientist* **46** (March 2013). [PDF](#)
466. Reply to Bruno’s Comment, *Phys. Rev. Lett.* **110**, 118902 (2013). [PDF](#)
467. Particle Physics: Minimalism triumphant *Nature* **496**, 439-441 (April 2013). [MIT-CTP 4458] [PDF](#)
468. Why Does the Higgs Particle Matter? *Big Questions Online* (April 2013). [PDF](#). bigquestionsonline.com/content/why-does-higgs-particle-matter.
469. The enigmatic electron *Nature* **498**, 31 (2013). [MIT-CTP 4466] [PDF](#)

470. Ken Wilson: A Scientific Appreciation, *Proceedings of the National Academy of Sciences of the United States of America*, **110**, 32, 12855–12856, DOI: 10.1073/pnas.1312463110 (2013). [PDF](#)
471. Review of “The God Problem: How a Godless Cosmos Creates” by Howard Bloom, *Physics Today* **66**, N7 (July 2013). [PDF](#)
472. Algebra of Majorana Doubling (with Jaehoon Lee), *Phys. Rev. Lett.* **111**, 226402 (2013). arXiv:1307.3245 [cond-mat.supr-con] [MIT-CTP 4481] [PDF](#)
473. Multiversality, *Class.Quant. Grav.* **30**, 19 (July 2013). hep-th/1307.7376 [MIT-CTP 4484] [PDF](#)
474. Superfluidity and Space-Time Translation Symmetry Breaking *Phys. Rev. Lett.* **111**, 250402 (2013). cond-mat.supr.con 1308.5949 [MIT-CTP 4486] [PDF](#)
475. Using Cosmology to Establish the Quantization of Gravity (with Lawrence Krauss) *Phys. Rev. D.* **89**, 047501 (2014), hep-th 1309.5343 [MIT-CTP-4497] [PDF](#)
476. Emergent Majorana Mass and Axion Couplings in Superfluids, *New Journal of Physics.* **16** (2014). hep-ph/1401.4379 [MIT-CTP4529] [PDF](#)
477. Majorana and Condensed Matter Physics, Chapter 14 in “The Physics of Ettore Majorana” (Cambridge University Press) (2014). cond-mat.supr-con 1404.0637 [MIT-CTP 4542] [PDF](#)
478. From B-Modes to Quantum Gravity and Unification of Forces (with Lawrence Krauss), gr-qc 1404.0634, April (2014). Awarded First place in 2014 by Gravity Research Foundation Awards for Essays on Gravitation, *Int. J. Mod. Phys. D* **23**, 1441001 (2014). [MIT-CTP 4543] [PDF](#)
479. Inflation Driven by Unification Energy, (with Mark Hertzberg), *Phys. Rev. D.* **95**, 063516 (2017). hep-th/1407.6010 [MIT-CTP 4551] [PDF](#)
480. Entanglement Enhanced Intensity Interferometry (with Jordan Cotler) (February 2015). quant-ph 1502.02477 [MIT-CTP 4641] [PDF](#)
481. Entangled Histories (with Jordan Cotler), quant-ph 1502.02480, (February 2015), MIT-CTP 4642. [PDF](#)
482. *Bell Tests for Histories* (with Jordan Cotler), quant-ph 1503.06458v1 (March 2015). [MIT-CTP 4653] [PDF](#)
483. *Physics in 100 Years* (2015). arXiv:1503.07735 [physics.pop-ph] [MIT-CTP 4654], (<https://bit.ly/2FLtIne>) [PDF](#)
484. *Particle physics: A weighty mass difference*, *Nature* **520**, 303 (2015). [MIT-CTP 4679] [PDF](#)
485. *Unification of Force and Substance*, *Phil. Trans. R. Soc. A* 374, 20150257 (2016) <https://doi.org/10.1098/rsta.2015.0257>. [MIT-CTP 4744] [PDF](#)
486. *Oscillatory Attractors: A New Cosmological Phase* (with Jasdeep Bains and Mark Hertzberg), *JCAP* **05**, 011 (2017). hep-th 1512.02304 [MIT-CTP 4745] [PDF](#)
487. *Superheavy Light Quarks and the Strong P, T Problem* (with Guy D. Moore) hep-ph 1601.02937 (January 2106). [MIT-CTP 4759] [PDF](#)
488. *Experimental test of entangled histories*, (with J. Cotler, L-M Duan, P-Y Hou, D. Xu, Z-Q Yin and Chong Zu) (January 2106). quant-ph 1601.02943 [MIT-CTP 4749] [PDF](#)
489. *Superfluidity and Symmetry Breaking: An Anderson Living Legacy*, in “A Lifetime of Emergence” (P. W. Anderson 90th birthday) ed. P. Chandra, P. Coleman, *World Scientific*, pp. 187-213, arXiv:1605.06993 (2016). [MIT-CTP 4781]. [PDF](#)
490. *Physics in 100 Years*, *Physics Today* **69**, 4, 32 (2016). doi: 10.1063/PT.3.3137. [PDF](#)
491. *Particle Physics and Condensed Matter: The Saga Continues*, The Royal Swedish Academy of Sciences, *Physica Scripta*, 2016, T168. arXiv:1604.05669 [MIT-CTP 4787] [PDF](#)
492. *Entanglement Enabled Intensity Interferometry of Different Wavelengths of Light* (with Jordan Cotler), (July 2016). quant-ph 1607.05719 [MIT-CTP-4814] [PDF](#)
493. *Statistics of fractionalized excitations through threshold spectroscopy*, (with Siddhardh C. Morampudi), *Phys. Rev. Lett.* 227201 (2017). cond-mat.str-el 1608.05700 [MIT-CTP/4822] [PDF](#)
494. *Theory Vision LHCP 2016*, *PoS LHCP2016 047* (2016). arXiv:1609.06941 [hep-ph] [MIT-CTP 4836] [PDF](#)
495. *Temporal Observables and Entangled Histories* (with Jordan S. Cotler), quant-ph 1702.05838v1,

- (February 2017), MIT-CTP-3881. [PDF](#)
496. *A Beautiful Question: Finding Nature's Deep Design* (Penguin) (2015).
 497. *A Model of Comprehensive Unification* (with Mario Reig, José W.F. Valle, C.A. Vaquera-Araujo), (June 2017), Report number:IFIC/17-XXX arXiv:1706.03116 [MIT-CTP-4913] [PDF](#)
 498. *What is the Value of Imagination and Wishful Thinking in Science?* (July 2017) [PDF](#)
 499. *Dilute and dense axion stars* (with Luca Visinelli, Sebastian Baum, Javier Redondo, Katherine Freese), *Phys. Lett. B. Vol. 777* (Feb 2018), p. 64-72. (<https://doi.org/10.1016/j.physletb.2017.12.010>). [PDF](#)
 500. *Experimental test of entangled histories* (with Jordan Cotler, Lu-Ming Duan, Pan-Yu Hou, Da Xu, Zhang-Qi Yin, Chong Zu), *ScienceDirect*, **387** (Dec 2017), p. 334-347. MIT-CTP-4749 (<https://doi.org/10.1016/j.aop.2017.09.004>) [PDF](#)
 501. Ludwig Faddeev Memorial Volume: *A Life In Mathematical Physics. Ludwig Faddeev Memorial Volume: A Life in Mathematical Physics*. World Scientific.
 502. *22 mind-blowing science facts we didn't know at the start of 2017* (about time crystals) (<https://bit.ly/2CNvSCn>)
 503. *The 10 Most Significant Scientific Breakthroughs of 2017*. Dec 30, 2017 (about time crystals) Bigthink.com (<https://bit.ly/2BZ2E0S>).
 504. *Highlights of the Year December 18, 2017 Physics 10, 137* (about time crystals). <https://physics.aps.org/articles/v10/137>. [PDF](#)
 505. *Light, the universe and everything – 12 Herculean tasks for quantum cowboys and black diamond skiers*, *Journal of Modern Optics*, 2018 **65**, No. 11, p.1261- 1308. (<https://doi.org/10.1080/09500340.2018.1454525>). [PDF](#)
 506. *Chiral Casimir Forces: Repulsive, Enhanced, Tunable* (with Qing-Dong Jiang). *Phys. Rev. B* 99, 125403. doi. [10.1103/PhysRevB.99.125403](https://doi.org/10.1103/PhysRevB.99.125403) (2019). MIT/CTP/5002.[PDF](#)
 507. *SO(3) Family symmetry and axions* (with Mario Reig, Jose W. F. Valle) *American Physical Society*, 98(9). *Phys. Rev. D* 98, 095008 (2018) MIT-CTP/5003. [PDF](#)
 508. *The Universality of Intelligence*, in: *Possible Minds: Twenty-Five Ways of Looking at AI*, ed. John Brockman. (Penguin, 2018) (Book chapter)
 509. *Has elegance betrayed physics?* *Physics Today* 71, 9, 57 (2018); (<https://doi.org/10.1063/PT.3.4022>) [PDF](#)
 510. *Axial Casimir Force* (with Qing-Dong Jiang) *American Physical Society*, 99(16) (2019). doi:10.1103/physrevb.99.165402 [MIT-CTP/6063]. [PDF](#)
 511. *Quantum Atmospheric for Materials Diagnosis* (with Qing-Dong Jiang) *American Physical Society*, 99(20) (2019). doi:10.1103/physrevb.99.201104 MIT-CTP/5056. [PDF](#)
 512. *Superdensity operators for spacetime quantum mechanics*. (with J. Cotler, Chiao-Ming Jian., Xiao-Ling Qi) *Journal of High Energy Physics*, 2018 (9), 93. [PDF](#)
 513. *Truncated Dynamics, Ring Molecules and Mechanical Time Crystals*. (with Dai Jin, Antti J. Niemi, Xubiao Peng) (2019). *Phys. Rev. A* 99, 023425. MIT-CTP/5110. [PDF](#)
 514. *The evolving unity of physics*. *Nature Reviews Physics* **1**, 5–7 (2019). [PDF](#)
 515. *Tunable axion plasma haloscopes* (2019) (with Matthew Lawson, Alexander J.Millar, Matteo Pancaldi, Edoardo Vitagliano) arXiv:1904.11872 [hep-ph]. *Phys. Rev. Lett.* **123**, 141802 520 (2019) NORDITA-2019-038, MIT-CTP-5116. (<https://doi.org/10.1103/PhysRevLett.123.141802>). [PDF](#)
 516. *Color erasure detectors enable chromatic interferometry*(with Luo-Yuan Qu, Jordan Cotler, Fei Ma, Jian-Yu Guan, Ming-Yang Zheng, Xiuping Xie, Yu-Ao Chen, Qiang Zhang, and Jian-Wei Pan) *Phys. Rev. Lett.* **123**, 243601 (2019) MIT-CTP/5111. [PDF](#)
 517. *Spectroscopy of spinons in Coulomb quantum spin liquids* (2019) (with Siddhardh C.Morampudi and Chris R. Laumann) arXiv:1906.01628 [cond-mat.str-el] *Phys. Rev. Lett* 124, 097204 (2020)

- MIT-CTP-5122. [PDF](#)
518. *Regularizations of Time Crystal Dynamics* (with Alfred Shapere). *Proceeding of the National Academy of Sciences* [arXiv:1708.03348](#) [cond-mat.stat-mech], PNAS September 17, 2019 116 (38) 18772-18776. MIT-CTP/4926. [PDF](#)
519. Synopsis: *A New Plasma-Based Axion Detector* (see 516). [PDF](#)
520. *Crystals in Time*. *Scientific American* **321**, 5, 28-36 (2019). doi:10.1038/scientificamerican1119-28.
521. *Quantum independent-set problem and non-Abelian adiabatic mixing* (with Biao Wu, Hongye Yu). *Phys. Rev. A* **101**, 012318 (2020). [PDF](#)
522. *Gloria Lubkin (1933-2020)*. *Physics Today*, February 2020 doi:10.1063/PT.6.4.20200211a. [PDF](#)
523. *Moving mirror model for quasithermal radiation fields* (with R.R. Good, V.Linder) *Phys. Rev. D* **101**, 025012 (2020). [PDF](#)
524. *Quantum overlapping tomography* (with Jordan Cotler), arXiv:1908.02754 (2019). *Phys. Rev. Lett.* Vol. 124,100401 (2020). MIT-CTP/5135. [PDF](#)
525. *Three Easy Pieces* (in tribute to Roman Jackiw). Contribution to Roman Jackiw: 80th Birthday Festschrift, ed. A. Niemi, T. Tomboulis, K. K. Phua (World Scientific) arXiv:1912.08092. MIT-CTP/5167. [PDF](#)
526. *Geometric Induction in Chiral Superconductors* (with Qing-Dong Jiang, T. H. Hansson). *Phys. Rev. Lett.* **124**, 197001 – Published 11 May 2020. doi: [10.1103/PhysRevLett.124.197001](#). arXiv:1912.06665 (2019). MIT-CTP/5166. [PDF](#)
527. *Resonant Quantum Search with Monitor Qubits* (with Hong-Ye Hu, Biao Wu), *CHIN. Phys. Lett.* Vol. 37, No. 5 (2020) 050304. MIT-CTP-5177. [PDF](#)
528. *Black and White Holes at Material Junctions* (with Yaron Kedem, Emil J. Bergholtz), arXiv:2001.02625 (2020). *Phys. Rev. Research* **2**, 043285 (2020). MIT-CTP/5165. [PDF](#)
529. *The Noise of Gravitons* (with M. Parikh, G. Zahariade), *International Journal of Modern Physics D* (2020) *Int. J. Mod. Phys. D* **29** (2020) 2042001. DOI: 10.1142/S0218271820420018 [arXiv:2005.07211](#). [PDF](#)
530. *Fundamentals – Ten keys to Reality* – Book. January 12, 2021. Penguin Press.
531. *Quantum Algorithm for Approximating Maximum Independent Sets* (with Hong-Ye Hu, Biao Wu). [arXiv:2005.13089](#) LT16932. *Chin. Phys. Lett.* Vol. 38, No.3(2021)030304. MIT-CTP/5120. [PDF](#)
532. *Chromatic interferometry with small frequency differences*, (with Luo-Yuan Qu, Lu-Chuan Liu, Jordan Cotler, Fei Ma, Jian-Yu Guan, Ming-Yang Zheng, Quan Yao, Xiuping Xie, Yu-Ao Chen, Qiang Zhang and Jian-Wei Pan) *Opt. Express* **28**, 32294-32301 (2020). [PDF](#)
533. *Signatures of the Quantization of Gravity at Gravitational Wave Detectors* (with M. Parikh and G.Zahariade). *PHYSICAL REVIEW D* **104**, 046021 (2021) arXiv:2010.08208 [hep-th] (2020). [PDF](#)
534. *Quantum Mechanics of Gravitational Waves*, (with M. Parikh and G. Zahariade). arXiv:2010.08205 [hep-th] (2020). *PHYSICAL REVIEW LETTERS* **127**, 081602 (2021). [PDF](#)
535. *Improved Spatial Resolution Achieved by Chromatic Intensity Interferometry*, (with Lu-Chuan Liu, Luo-Yuan Qu, Cheng Wu, Jordan Cotler, Fei Ma, Ming-Yang Zheng, Xiu-Ping Xie, Yu-Ao Chen, Qiang Zhang, Jian-Wei Pan) *PHYSICAL REVIEW LETTERS* **127**, 103601 (2021) arxiv. 2102.02060, Feb 2021. [PDF](#)
536. *Models of Hidden Purity*. (2021). arXiv:2107.13593, 2021. MIT-CTP/5260. [PDF](#)
537. *Revisiting the Unusual Celebrity of Stephen Hawking* (book review) *The New York Times*. April 18, 2021. [PDF](#)
538. *Freeman Dyson (1923- 2020)*. *SCIENCE*. 15 May 2020. Vol 368, Issue 6492. p. 715•DOI: 10.1126/science.abb8579. [PDF](#)
539. *My Mystical Moment*. *Edge Conversations*. Sept 7, 2021. [PDF](#)
540. *Black and white holes at material junctions* (with Yaron Kedem, Emil J. Bergholtz) *Phys. Rev.*

- Research 2, 043285 (2020). [duplicates 528] [PDF](#)
541. *Models of Hidden Purity*. July 28, 2021. arXiv:2107.13593 [quant-ph]. [PDF](#).
542. *Quantum Computing by Coherent Cooling* (with Jiajin Feng and Biao Wu). August 3, 2021. PHYSICAL REVIEW A 105, 052601 (2022). arXiv:2106.07522 [quant-ph]. [PDF](#)
543. *Adiabatic construction of hierarchical quantum Hall states* (with Martin Greiter) Phys. Rev. B 104, L121111 (2021). [PDF](#).
544. *Exceptional dynamics of interacting spin liquids* (with Kang Yang, Daniel Varjas, Emil J. Bergholtz, Sid Morampudi) arXiv:2202.03445. MIT-CTP/5402. [PDF](#).
545. *Chirality: A Scientific Leitmotif*. Dec 2021. Keynote talk at Nobel Symposium 167, "Chiral Matter", Stockholm June 2021. To be published in the proceedings. arXiv:2112.06927. MIT-CTP/5376. [PDF](#).
546. *Finite thermal particle creation of Casimir light* (with Michael R. R. Good, Eric V Linder) Aug 2021. Modern Physics Letters A, Vol. 35, No. 03, 2040006 (2020). arXiv:2108.11188. [PDF](#)
547. *Quantum Computing by Coherent Cooling* (with Jia-Jin Feng, Biao Wu). Phys. Rev. A 105, 052601 May 2022. [PDF](#)
548. *Gauge Symmetry in Shape Dynamics*. To be published in C. N Yang 100 Anniversary volume (World Scientific) <https://arxiv.org/abs/2205.10806>. June 2022. MIT-CTP/5437. [PDF](#)
549. *Dynamics of the hot QED in Coulomb quantum spin liquids*. MIT-CTP/5410.
550. *Through the Higgs portal* CERN Courier. July 2022. [PDF](#)
551. *Substructure of Multiquark Hadrons* (Snowmass 2021 White Paper). March 2022. [arXiv:2203.16583](https://arxiv.org/abs/2203.16583) [hep-ph]. [PDF](#)
552. *Solving independent set problems with photonic quantum circuits*. Published PNAS Research article, Computer Sciences, 2023 Vol 120 No 22 e2212323120. [PDF](#)
553. Interview 36 in "Conversations on Quantum Gravity", ed. J. Armas, pp. 682-697 (Cambridge U. Press, 2021). [PDF](#)
554. *ALPHA: Searching For Dark Matter with Plasma Haloscopes*. March 2023. Phys. Rev. D 107, 055013 – Published 10 March 2023. [PDF](#).
555. "Colloquium: Quantum and classical discrete time crystals" (with Michael P. Zaletel, Mikhail Lukin, Christopher Monroe, Chetan Nayak, and Norman Y. Yao). Rev. Mod. Phys. 95, 031001 – Published 7 July 2023. URL: <https://link.aps.org/doi/10.1103/RevModPhys.95.031001> DOI: 10.1103/RevModPhys.95.031001. [PDF](#)
556. *Emergent axion response in multilayered metamaterials* (with Leon Shaposhnikov, Maxim Mazanov, Daniel A. Bobylev, Maxim A. Gorlach). Phys. Rev. B 108, 115101 – Published 1 Sept 2023. <https://doi.org/10.48550/arXiv.2302.05111>. [PDF](#)
557. Peer Review: Oppenheimer: Aug 2023. <https://t.co/XAEml5G3ef>
558. *Emergent Chern-Simons Interactions in 3+1 Dimensions* (with Marcus Stålhammar, Darya Rudneva, Thors Hans Hansson). <https://link.aps.org/doi/10.1103/PhysRevB.109.064514> Phys. Rev. B 109, 064514. Feb 2024. [PDF](#)
559. "Ambiguity, Invisibility, and Negativity". J. Phys. A: Math. Theor. 57 (2024) 185401 (7pp). MIT-CTP/5609. [PDF](#)
560. *QCD at 50: Golden Anniversary, Golden Insights, Golden Opportunities*. March 2024. arXiv:2403.06038. MIT-CTP/5689. [PDF](#)
561. *Fractional Statistics* (with M Greiter) March 2024. Annual Review of Condensed Matter Physics Vol. 15:131-157. <https://doi.org/10.1146/annurev-conmatphys-040423-014045>. MIT-CTP/5401. [PDF](#)
562. *Detecting a long-lived false vacuum with quantum quenches*. (with Lagnese, G., Surace, F. M.,

- Morampudi. *Physical Review Letters* 133.24 (2024): 240402 .[PDF](#)
563. *Probability of Presence Versus $\int |\psi(x, t)|^2 \psi(x, t)$* . (with Zara Yu) arXiv preprint arXiv:2405.04493 (2024). To appear in *Annals of Physics* <https://www.sciencedirect.com/science/article/pii/S0003491625000168> MIT-CTP/5719.. [PDF](#)
564. *"Probing false vacuum decay on a cold-atom gauge-theory quantum simulator."* (with Zhu, Zihan, et al) arXiv preprint arXiv:2411.12565 (2024).[PDF](#)
565. *"Detecting Acoherence in Radiation Fields."* (with Manikandan, Sreenath K) arXiv:2409.20378 (2024). MIT-CTP/5485. [PDF](#)
566. *"Probing ultrafast magnetization dynamics via synthetic axion fields."* (with Shaposhnikov, Leon, et al.) arXiv:2405.19160 (2024).[PDF](#)
567. *"Free Will and Falling Cats."* arXiv:2405.04565 (2024). MIT-CTP/5718. [PDF](#)
568. *"Super-resolution imaging based on active optical intensity interferometry."* (with Liu, Lu-Chuan, et al.) arXiv:2404.15685 (2024). [PDF](#)
569. *Quantum Hamiltonian Algorithms for Maximum Independent Sets.* (with Zhao, Xianjue, et al.) arXiv:2310.14546 (2023).[PDF](#)
570. *Enhanced Condensation Through Rotation.* (with Chernodub, Maxim) arXiv e-prints (2025): arXiv-2501.[PDF](#)