

## **JOHN F. DONOGHUE**

Department of Physics  
University of Massachusetts  
Amherst, MA 01003  
Tel: (413) 545-2540  
E-mail: [donoghue@physics.umass.edu](mailto:donoghue@physics.umass.edu)  
Web site: <http://blogs.umass.edu/donoghue/>

---

**Personal Data:** Born November 30, 1950  
U.S. Citizen  
Married, 3 children

**Research Field:** Theoretical Elementary Particle Physics  
- Effective Field Theory  
- Particle Phenomenology  
- Fundamental Interactions  
- Gravity and the Early Universe

### **Education:**

1968-1972 B.S. Physics, June 1972, University of Notre Dame  
1972-1976 Ph.D. Physics, September 1976, University of Massachusetts

### **Employment:**

1976-1978 Research Associate, Carnegie Mellon University  
1978-1980 Research Associate, Massachusetts Institute of Technology  
1980-1984 Visiting Assistant Professor, University of Massachusetts  
1984-1985 Visiting Associate Professor, University of Massachusetts  
1985-1988 Associate Professor, University of Massachusetts  
1988-present Professor, University of Massachusetts  
1989-1990 Scientific Associate, CERN, Geneva  
Fall 1999 Scientific Associate, CERN, Geneva  
1996-2003 Head, Department of Physics  
Spring 2003 Visiting Researcher, IHES, Bures sur Yvette, France  
Fall 2005 Acting Head, Department of Physics

### **Honors and Awards:**

1987 Samuel F. Conte Faculty Research Fellowship  
1990 Fellow—American Physical Society  
2003 Outstanding Service Award, College of Natural Science and Mathematics  
2005 Chancellor's Medal and Distinguished Faculty Lectureship

## **Memberships:**

Fellow, American Physical Society, Division of Particles and Fields

## **Present Funding:**

National Science Foundation: (with co-PIs Golowich, Kastor, Sorbo and Traschen) 7/1/09-6/30/12 , \$1,080,00

Foundational Questions Institute: 8/1/06 -7/31/10, \$63,000

## **Funding History:**

I have been supported continuously since 1980 by the National Science Foundation. Initially this was for an individual grant supporting me in a research faculty position. Then when I transitioned to the regular faculty, I joined the theory group grant, with co-PIs over the years including Brehm, Golowich, Holstein, Kastor, Sorbo, Swift and Traschen.

In addition I have obtained an occasional odd grant such as one from the NSF International Programs (with Barry Holstein, D. Tadic and J. Trampetic) and the Templeton Foundation.

## **Selected Teaching Activities**

P152 – Electromagnetism and Thermodynamics for Engineers

P421 – Mechanics for Physics Majors

P601 – Classical Mechanics

P 602 – Statistical Mechanics

P606 – Electromagnetism

P614 – Quantum Mechanics II

P714 – Introduction to Particle Physics

P811 – Quantum Field Theory

P821 – General Relativity

P822 – The Standard Model

## **Graduate Students:**

I have supervised 14 Ph.D. students. A list along with their research papers can be found at SPIRES <http://www.slac.stanford.edu/spires/find/hepnames/www?phdadv=Donoghue,+John+F.> Of these, Vincenzo Cirigliano, Alexey Petrov, German Valencia, Gustavo Burdman and Carlos Ramirez have obtained faculty positions, and I expect some of the newer students to follow in this path.

## **Selected Service Activities:**

Divisional Associate Editor, Physical Review Letters

Associate Editor, Physical Review

Scientific Director, Theoretical Advanced Study Institute (TASI)

Dannie Heinemann selection committee – member 2006 and chair 2007

Department Head, 1996-2003

Acting Department Head Fall 2005

Natural Sciences and Mathematics Initiatives Committee 2005-2007

Dept Head Selection committees: Biology, Computer Science, Math, Astronomy

Graduate Union negotiating committee (administrative side)

# PUBLICATIONS

## A. Conference Proceedings and other Publications:

1. Asymmetries and polarization in deep inelastic neutrino scattering, "Proceedings of the Neutrino 78 Conference", ed. by E.C. Fowler (Purdue Univ., 1978), p. c229.
2. Dynamics of light hadrons—mostly glueballs, "Experimental Meson Spectroscopy—1980", Ed. by S.U. Chung and S.J. Lindenbaum, p. 104.
3. Scattering quarks off the vacuum, "High Energy Physics—1980", ed. by L. Durand and L.G. Pondrum, p. 1042.
4. Glueballs and the pion, "High Energy Physics—1980", ed. by L. Durand and L.G. Pondrum, p. 35.
5. Glueballs in the bag, in "Gauge Theories, Massive Neutrinos and Proton Decay" (Orbis Scientia 1981), edited by A. Perlmutter, Plenum (New York, 1981), p.85.
6. Glueballs and the vacuum, in "Theoretical Aspects of Quantum Chromodynamics", edited by J.W. Dash (Marseille, 1981), p. 136.
7. Expectations for glueballs, in "Particles and Fields—1981: Testing the Standard Model", ed. by C. Heusch and W.T. Kirk (AIP, 1982), p. 97.
8. The Chew-Low theory and the quark model, in "Asymptotic Realms of Physics—Essays in Honor of Francis Low", ed. by A. Guth, K. Huang and R.L. Jaffe (MIT Press, Cambridge, 1983), p. 128.
9. Bag models of hadrons, (with C. DeTar), Annual Review of Nuclear and Particle Science, Vol. 33, p. 235 (1983).
10. Glueball candidates, "Proceedings of the XXI International Conference on High Energy Physics", Journal de Physique D3, 189 (1983).
11. The status of semileptonic hyperon decay, "Proceedings of the XXI International Conference on High Energy Physics", Journal de Physique C3, 231 (1983).
12. Gluons, "McGraw Hill Yearbook of Science and Technology", 1984, p. 200.
13. Mass and mixing of pseudoscalar mesons:  $\eta'(960)$  and  $i(1440)$ , in "Gluons and Heavy Flavors", ed. by J. Tran Thanh Van, Editions Frontieres (gif sur Yvette, 1983) p. 505.
14. Studies of the  $J^{PC} = 0^{-+}$  spectrum, in "Experimental Meson Spectroscopy—1983", ed. by S.J. Lindenbaum (AIP, NY, 1984) p. 107.

15. Low energy weak interactions and the quark model, in "Phenomenology of Unified Theories—From the Standard Model to Sypersymmetry", ed. by H. Galic, B. Guberina and D. Tadic (World Scientific, 1984) p. 1.
16. The proton as a soliton and effective chiral Lagrangians in "The Quark Structure of Matter", ed. by N. Isgur, G. Karl and P.J. O'Donnell (World Scientific, 1985) p. 83.
17. Theory summary—hadron spectroscopy 1985, in "Hadron Spectroscopy—1985", ed. by S. Oneda (AIP, 1985), p. 460.
18. CP violation in the KM and Higgs boson models in "The Sante Fe Meeting" ed. by T. Goldman and M.M. Nieto (World Scientific, 1985) p. 326.
19. Theta, phi-phi, and iota, "Proceedings of the International Europhysics Conference on High-Energy Physics", ed. by L. Nitti and G. Preparata, p. 326.
20. Weak decay and CP violation, "Proceedings of the International Europhysics Conference on High-Energy Physics", ed. by L. Nitti and G. Preparata, p. 261.
21. CP violation experiments using hyperons at a  $p\bar{p}$  machine, "Proceedings of the Workshop on Antimatter Interactions at Low Energy", ed. by B. Bonner and L.S. Pinsky (Fermilab 1986) p. 241.
22. CP-odd asymmetry at low energy, in "Intersections between Particle and Nuclear Physics" (AIP, NY, 1986) ed. by D. Geesaman, p. 495.
23. Hadron spectroscopy summary, in "Intersections between Particle and Nuclear Physics" (AIP, NY, 1986) ed. by D. Geesaman, p. 313.
24. CP violation: status and future, in "Quarks, Strings, Dark Matter and All the Rest", (World Scientific, Singapore, 1987) ed. by R. Panvini, p. 13.
25. Summary of  $\varepsilon$ ,  $\varepsilon'$  and the  $\Delta I = 1/2$  rule, "Proceedings of the XXIII International Conference on High Energy Physics", (World Scientific, Singapore, 1987), ed. by S. Loken, p. 862.
26. On the content of the nucleon, "Proceedings of the Second International Conference on  $\pi N$  Physics", ed. by W. Gibbs and B. Nefkens, (Los Alamos, 1987) p. 283.
27. New ways to find CP violation, "New and Exotic Phenomena" ed. by O. Fackler and J. Tran Thank Van, p. 85 (Editions Frontiers; Gif sur Yvette) (1987).
28. On the content of the nucleon, "Proceedings of the Second Int. Conf. on  $\pi N$  Physics", ed. by W. Gibbs and B. Nefkens, (Los Alamos, 1987) p. 283.
29. Overview of the theory of hyperon decay, "High Energy Spin Physics", ed. by K. Heller (AIP, NY) p. 418.

30. Chiral symmetry in QCD, "Proceedings of the III Int. Conf. on Intersection between Nuclear and Particle Physics", ed. by G. Bunce, (AIP, NY, 1988) p. 68.
31. CP violation in kaon, hyperon and B meson systems, "Proceedings of the III Int. Conf. on Intersections between Nuclear and Particle Physics", ed. by G. Bunce, (AIP, NY, 1988) p. 341.
32. Nonleptonic kaon decay and chiral symmetry, "Proceedings of the Ringberg Workshop on Hadronic Weak Decays and Matrix Elements", (Nucl. Phys. B7A, 1989) 59.
33. On the origin of chiral lagrangians, "Symmetry Violations in Subatomic Physics", ed. by B. Castel and P.J. O'Donnell, (World Scientific, Singapore, 1989) p. 3.
34. Light quark masses and chiral symmetry, Ann. Rev. Nucl. Part. Sci., 39, 1 (1989).
35. CP violation, (with B.R. Holstein) "1990 Yearbook: Encyclopedia of Physical Science and Technology", ed. R.A. Meyers, Academic Press, New York (1989), p. 289.
36. CP violation, (with B.R. Holstein) "Encyclopedia of Modern Physics", Ed. R.A. Meyers, Academic Press, New York (1989), p. 109.
37. Program for rare K decays, "New Directions for Neutrino Physics", (FNAL, 1989) p. 187.
38. Models of  $b \rightarrow u$  semileptonic decay, "CP Violation and Beauty Factories", ed. D.B. Cline and A. Freedman, Annals of N.Y. Acad. of Science 619, 67 (1991).
39. Chiral symmetry as an experimental science, "Medium Energy Antiprotons and the Quark-Gluon Structure of Hadrons", ed. R. Landua, J-M. Richard and L. Klapisch (Plenum, NY, 1991) p. 39.
40. Rare meson decay and low energy QCD, "Proceedings of Workshop on Rare Decays of Light Mesons", Paris (1990).
41. CP violation in kaon decays, "Proceedings of Workshop on Physics for Dafne", ed. by G. Pancheri, p. 131 (INFN, Frascati, 1991).
42. SU(3) and symmetry groups (with S.L. Glashow) "Encyclopedia of Physics", ed. by R. Lerner and G. Trigg (AIP, 1991) p. 1215.
43. B decays, report of the working group on high luminosities at LEP, J.F. Donoghue and D. Treille (convenors) et. al., CERN Yellow Report 91-02, ed. by E. Blucher et. al. (CERN, 1991).
44. Theories of Heavy Quark Decay, "Heavy Flavour Physics", ed. by M. Davies and G. Wormser, p. 73-91 (Edition Frontieres, Gif-sur-Yvette, 1992).
45. Introduction to nonlinear effective field theory "Effective Field Theories of the Standard Model", ed. by U-G. Meissner, p. 3-20 (World Scientific, Singapore, 1992).

46. Quark Masses, Kaon masses and  $\eta \rightarrow 3\pi$  "Proceedings of the XXVI Intl. Conf. on High Energy Physics", ed. J. Sanford (AIP, 1993) p 1562-1565.
47. Light Quark Masses and Mixing Angles "The Building Blocks of Creation—From Microfermis to Megoparsecs (TASI 93)", (World Scientific, Singapore 1994) ed. S. Raby and T. Walker, 27 pages.
48. On the Marriage of Chiral Perturbation Theory and Dispersion Relations, in "Chiral Dynamics in Hadron and Nuclei", ed. by Dong-Pil Min and Mannque Rho (Seoul National University Press, 1995) p. 87.
49. Calculation of a Weak Matrix Element using Weinberg Sum Rules, "Proceedings of the XXVII International Conference on High Energy Physics", ed. by P.J. Bussay and I.G. Knowles (World Scientific, 1995) p. 1067.
50. The Ideas of Gravitational Effective Field Theory, "Proceedings of the XXVII International Conference on High Energy Physics", ed. by P.J. Bussay and I.G. Knowles (World Scientific, 1995) p. 1061.
51. Introduction to the Effective Field Theory Description of Gravity, "Proceedings of the Advanced School on Effective Field Theory", Almunecar, Spain, June 1995,
52. Gravity and Effective Field Theory: A Talk for Phenomenologists. "Proceedings of the International Symposium on Particle Theory and Phenomenology, Ames, Iowa, 1995
53. Dispersion Relations and Effective Field Theory, "Proceedings of the Advanced School on Effective Field Theory", Almunecar, Spain, June 1995.
54. The Quantum Theory of General Relativity at Low-energies, "Proceedings of the Annual European Meeting on General Relativity, Cosmology, Astrophysics and Quantum Field Theory Journees Relativistes," Ascona, Switzerland, 26, (1996). *Helv. Phys. Acta* **69**, 269 (1996).
55. Quantum General Relativity is an Effective Field Theory, "Proceedings of the 10th International Conference on Problems of Quantum Field Theory," Alushta, Ukraine, 13, May 1996.
56. Final state interactions in the decays of heavy quarks, "Proceedings of the 3rd German-Russian workshop on progress in heavy quark physics," 20, (1996).
57. New Results on Final State Interactions in Heavy Quark Physics, "Proceedings of the XXXI Rencontre de Moriond: Electroweak Interactions and Unified Theories", Les Arcs, France, 16, March 1996. "Les Arcs 1996, Electroweak Interactions and Unified Theories," 341.
58. On the factorization in non-leptonic decays of heavy mesons, A.A. Petrov and J.F. Donoghue invited talk at the Division of Particles and Fields of the American Physical Society, Minneapolis, Minnesota, 11-15 Aug 1996. in "DPF '96: Proceedings" ed. by H. Heller, J.K. Nelson, D. Reeder. Singapore, World Scientific, 1998 781-784

59. Properties of soft final state interactions in B decays. J.F. Donoghue, E. Golowich, A. Petrov, and J.M. Soares invited talk at the Division of Particles and Fields of the American Physical Society, Minneapolis, Minnesota, 11-15 Aug 1996. in "DPF '96: Proceedings" ed. by H. Heller, J.K. Nelson, D. Reeder. Singapore, World Scientific, 1998 p.785-788
60. Nonperturbative Methods in Kaon Physics: Aside From the Lattice, "Workshop on K Physics," Orsay, France, (1996).
61. Perturbative Dynamics of Quantum General Relativity, "Proceedings of the 8th Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories (MG 8)," Jerusalem, Israel (1997).
62. An Introduction to Effective Field Theory, Lectures at the 6th Workshop on Hadron Physics, Florianopolis, Santa Catarina, Brazil, 16-21 Mar 1998. In "Hadron physics 98" ed by E. Ferreira, F. de Souza Curz and S. Avancini (World Scientific, 1999) p. 2-26.
63. Fine Tunings and Quark Masses: Phenomenology of Multiple Domain Theories, hep-ph/9912298, 3pp. Proceedings International Europhysics Conference on High-Energy Physics (EPS-HEP 99), Tampere, Finland, 15-21 Jul 1999. pp. 764-766
64. Random Values of the Physical Parameters, hep-th/0012047 3pp. Talk given at DPF 2000: The Meeting of the Division of Particles and Fields of the American Physical Society, Columbus, Ohio, 9-12 Aug 2000. Published in the proceedings, ed. by K.K. Gan, R. Kass. Singapore, World Scientific, 2001. (Int. J. Mod. Phys. A. Suppl. 1A-C (2001) 1)
65. New Insights Concerning Dimension Eight Effects in Weak Decays, hep-ph/0012072 3pp. Talk given at DPF 2000: The Meeting of the Division of Particles and Fields of the American Physical Society, Columbus, Ohio, 9-12 Aug 2000. Published in the Proceedings, ed. by K.K. Gan, R. Kass. Singapore, World Scientific, 2001. (Int. J. Mod. Phys. A. Suppl. 1A-C (2001) 1)
66. The influence of Dimension Eight Operators on Weak Matrix Elements, Invited talk at International Euroconference in Quantum Chromodynamics: 15 Years of the QCD – Montpellier Conference (QCD 00), Montpellier, France, 6-13 Jul 2000. hep-ph/0010111. Nucl.Phys.Proc.Suppl.**96**:329-335 (2001)
67. Theoretical Review of  $\varepsilon'/\varepsilon$  in the Standard Model, Invited rapporteur talk at KAON 2001, Pisa Italy, June 2001, Published in the proceedings, ed by F. Costantini, G. Isidori and M. Sozzi (Frascati Physics Series, Frascati, 2001).
68. Broken Symmetry, in "Building Blocks of Matter, a supplement to the Macmillin Encyclopedia of Physics", (Macmillin, 2003)
69. Renormalization, in "Building Blocks of Matter, a supplement to the Macmillin Encyclopedia of Physics", (Macmillin, 2003)

70. CP Violation (with B. R. Holstein), in Encyclopedia of Physical Science and Technology, Third Edition, Vol. 3 ,(Academic Press, 2001) pp. 853-856
71. Improved determination of  $B_7$  and  $B_8$ . E. Golowich, J.F. Donoghue, K. Maltman and V. Cirigliano, International Europhysics Conference on High-Energy Physics (HEP 2001), Budapest, Hungary, 12-18 Jul 2001. Published in "Budapest 2001, High energy physics" ed. By D Horvath, P. Levai and A. Patkos.
72.  $K \rightarrow \pi\pi$  electroweak penguins in the chiral limit. V. Cirigliano, J.F. Donoghue, E. Golowich, Kim Maltman,. Contributed to QCD 02: High-Energy Physics International Conference in Quantum Chromodynamics, Montpellier, France, 2-9 Jul 2002. Nucl.Phys.Proc.Suppl.**121**:199-202,2003, AIP Conf.Proc.**717**:675-679,2004 Also in \*Montpellier 2002, Quantum chromodynamics\* 199-202 Also in \*Aschaffenburg 2003, Hadron spectroscopy\* 675-679 e-Print Archive: hep-ph/0209332
73. The chiral limit matrix element  $K$  to  $\pi\pi$  of the electroweak penguin operators, K. Maltman, V. Cirigliano, J.F. Donoghue, E. Golowich, 2nd Asia Pacific Conference on Few-Body Problems in Physics (APFB 02), Shanghai, China, 27-30 Aug 2002. Published in Mod.Phys.Lett.**A18**:366-369 (2003)
74.  $\epsilon'/\epsilon$  and the electroweak penguin contribution.V. Cirigliano, J.F. Donoghue, E. Golowich and K. Maltman,. 31st International Conference on High Energy Physics (ICHEP 2002), Amsterdam, The Netherlands, 24-31 Jul 2002. Published in "Amsterdam 2002, ICHEP" Edited by S. Bentvelsen, P. de Jong, J. Koch, E. Laenen. Amsterdam, The Netherlands, North-Holland, 2003. 973p. (High Energy Physics Proceedings) p. 462-464
75. SU(3) and Symmetry Groups, published in the Encyclopedia of Physics, Wiley , 6 pages
76. The fine-tuning problems of particle physics and anthropic mechanisms, This is a chapter in the book 'Universe or Multiverse' ed. by Bernard Carr pp 231-246 (Cambridge Univ. Press).
77. When Effective Field Theories Fail, Opening talk at the International Workshop on Effective Field Theories, Valencia, Feb 2009, to be published in the proceedings (Proceedings of Science)



## B. Journal Articles:

1. Charmed nonleptonic decay in asymptotically free theories, (with B.R. Holstein), Phys. Rev. **D12**, 1454 (1975).
2. Phenomenological analysis of a fixed-sphere bag model, (with E. Golowich and B.R. Holstein), Phys. Rev. **D12**, 2875 (1975).
3. Parity violating internucleon potential and strong interaction enhancement, Phys. Rev. **D13**, 2064 (1976).
4. Applications of a fixed sphere bag model, (with E. Golowich), Phys. Rev. **D14**, 1386 (1976).
5. Parity violating vector meson exchange internucleon potential in a modified factorization approach, Phys. Rev. **D15**, 184 (1977).
6. Strong interactions and the  $\Delta I = 1/2$  rule in weak nonleptonic decay, (with E. Golowich and B.R. Holstein), Phys. Rev. **D15**, 1341 (1977).
7. Cabibbo suppressed nonleptonic decays of charmed mesons, (with L. Wolfenstein), Phys. Rev. **D15**, 3341 (1977).
8. Quark sea and quantum chromodynamics, (with E. Golowich), Phys. Rev. **D15**, 3421 (1977).
9. Quark sea and the  $\Delta I = 1/2$  rule, (with E. Golowich), Phys. Lett. **69B**, 437 (1977).
10. Does the heavy charged lepton have its own neutrino?, (with L. Wolfenstein), Phys. Rev. **D17**, 224 (1978).
11. The Adler Weisberger relation and the quark model, (with D. Wyler), Phys. Rev. **D17**, 280 (1978).
12. Hadronic polarization in neutrino scattering, Phys. Rev. **D17**, 2922 (1978).
13. T violation in  $SU(2) \times U(1)$  gauge theories of leptons, Phys. Rev. **D18**, 1632 (1978).
14. Properties of charged Higgs bosons, (with Ling-Fong Li), Phys. Rev. **D19**, 945 (1979).
15. Finite renormalization, flavor mixing and weak decays, Phys. Rev. **D19**, 945 (1979).
16. Comment on polarized fragmentations functions, Phys. Rev. **D19**, 2806 (1979).
17. Tensor analysis of hadronic jets in quantum chromodynamics, (with F.E. Low and So-Young Pi), Phys. Rev. **D20**, 2759 (1979).

18. Unified treatment of the parity violating nuclear force, (with B. Desplanques and B.R. Holstein), *Annals of Physics* **124**, 449 (1980).
19. Analysis of  $\Delta S = 1$  nonleptonic weak decays and the  $\Delta I = 1/2$  rule, (with E. Golowich, W.A. Ponce and B.R. Holstein), *Phys. Rev.* **D21**, 186 (1980).
20. Dynamical effects in two body charm decay, (with B.R. Holstein), *Phys. Rev.* **21**, 1334 (1980).
21. The pion and an improved static bag, (with K. Johnson), *Phys. Rev.* **D21**, 1975 (1980).
22. Proton lifetime and branching ratios in SU(5), *Phys. Lett.* **92B**, 99 (1980).
23. Quark-vacuum scattering, *Phys. Rev.* **D22**, 1789 (1980).
24. A compendium of bag-model matrix elements of the weak nonleptonic Hamiltonian, (with E. Golowich, B.R. Holstein and W.A. Ponce), *Phys. Rev.* **D23**, 1213 (1981).
25. Low mass glueballs in the meson spectrum, (with K. Johnson and B.A. Li), *Phys. Lett.* **99B**, 416 (1981).
26. The annihilation diagram in three body D meson decay, (with B.R. Holstein), *Phys. Lett.* **99B**, 433 (1981).
27. Comment on the proton decay mode  $P \rightarrow e^+ \pi^0$ , (with G. Karl), *Phys. Rev.* **D24**, 230 (1981).
28. Implications of nuclear parity nonconservation, (with B.R. Holstein), *Phys. Rev. Lett.* **46**, 1603 (1981).
29. Higgs boson exchange models of CP violation and  $K \rightarrow 2 \pi$ , (with J.S. Hagelin and B.R. Holstein), *Phys. Rev.* **D25**, 195 (1982).
30. Quark model calculation of the weak electric coupling in semileptonic baryon decay, (with B.R. Holstein), *Phys. Rev.* **D25**, 206 (1982).
31. Phenomenology of an f(1270)-glueball mixture, *Phys. Rev.* **D25**, 1875 (1982).
32. Bogoliubov transformations and calculation of coupling constants, *Phys. Rev.* **D25**, 854 (1982).
33. Evidence for SU(3) breaking in Cabibbo-type fits of semileptonic hyperon decay, (with B.R. Holstein), *Phys. Rev.* **D25**, 2015 (1982).
34. Glueballs, *Comments Nucl. Part. Phys.* **10**, 277 (1982).
35. Interpreting the  $i(1440)$ , (with H. Gomm), *Physics Letters* **112B**, 409 (1982).

36. Strong bounds on weak couplings, (with B.R. Holstein), Physics Letters **113B**, 382 (1982).
37. Proton decay via three quark fusion, (with E. Golowich), Phys. Rev. **D26**, 3092 (1982).
38. The  $\Delta S = 2$  matrix element for  $K^0\bar{K}^0$  mixing (with E. Golowich and B.R. Holstein), Phys. Lett. **119B**, 412 (1982).
39. On the mixing of pseudoscalar mesons, (with H. Gomm), Phys. Lett. **121B**, 49 (1983).
40. QCD prediction for pseudoscalar production in radiative decays of heavy vector mesons, (with H. Gomm) Phys. Lett. **122B**, 309 (1983).
41. Wave function renormalization and nuclear parity violation, (with B.R. Holstein), Phys. Lett. **125B**, 509 (1983).
42. Renormalization and radiative corrections at finite temperature, (with B.R. Holstein), Phys. Rev. **D28**, 340 (1983).
43. Flavor changes in locally supersymmetric theories, (with H.P. Nilles and D. Wyler), Phys. Lett. **128B**, 55 (1983).
44. Calculation of the masses of  $\eta(549)$  and  $\eta'(960)$  in the bag model, (with H. Gomm), Phys. Rev. **D28**, 2800 (1983).
45. Direct quark model calculation of weak nonleptonic matrix elements, (with B.R. Holstein), Phys. Rev. **D29**, 489 (1984).
46. The gluon "mass" in the bag model, Phys. Rev. **D29**, 2559 (1984).
47. Long distance chiral contribution to the  $K_L K_S$  mass difference, (with E. Golowich and B.R. Holstein), Phys. Lett. **135B**, 481 (1984).
48. Dispersive contribution to  $K^0\bar{K}^0$  mixing and CP violation, (with B.R. Holstein), Phys. Rev. **D29**, 2088 (1984).
49. The temperature measured by a uniformly accelerated observer, (with B.R. Holstein), American Journal of Physics **52**, 730 (1984).
50. Kaon decays and a determination of the scale of chiral symmetry, (with E. Golowich and B.R. Holstein), Phys. Rev. **D30**, 587 (1984).
51. Predicting the proton mass from  $\pi\pi$  scattering data, (with E. Golowich and B.R. Holstein), Phys. Rev. Lett. **53**, 747 (1984).
52. Electromagnetic decays of glueballs, Phys. Rev. **D30**, 114 (1984).
53. Chiral symmetry and the penguin interaction, Phys. Rev. **D30**, 1499 (1984).

54. The principle of equivalence at finite temperature, (with B. Holstein and R.W. Robinett), *General Relativity and Gravitation* **17**, 207 (1985).
55. Renormalization of the energy momentum tensor and the validity of the equivalence principle at finite temperature, (with B.R. Holstein and R.W. Robinett), *Phys. Rev.* **D30**, 2561 (1984).
56. Measurement of the weak neutral current from nuclear parity violation, (with B.R. Holstein), *Phys. Rev.* **D31**, 70 (1985).
57. Signals of CP non-conservation in hyperon decay, (with S. Pakvasa), *Phys. Rev. Lett.* **55**, 162 (1985).
58. Reanalysis of Higgs-boson-exchange models of CP violation, (with B.R. Holstein), *Phys. Rev.* **D32**, 1152 (1985).
59. Quantum electrodynamics at finite temperature, (with B.R. Holstein and R.W. Robinett), *Annals of Physics* **164**, 233 (1985).
60. Nonleptonic decays of chiral solitons and a possible resolution of the S-wave/P-wave puzzle, (with E. Golowich and Y.-C. R. Lin), *Phys. Rev.* **D32**, 1733 (1985).
61. Semileptonic hyperon decay—a problem for chiral perturbation theory, (with B.R. Holstein), *Phys. Lett.* **160B**, 173 (1985).
62. Electromagnetic effects in  $\psi' \rightarrow J/\psi + \pi^0$  and quark masses, (with S.F. Tuan) *Phys. Lett.* **164B**, 401 (1985).
63. Chiral loops in  $\pi^0$ ,  $\eta^0 \rightarrow \gamma\gamma$  and  $\eta$ - $\eta'$  mixing (with B.R. Holstein and Y.-C.R. Lin), *Phys. Rev. Lett.* **55**, 2766 (1985).
64. Low energy weak interactions of quarks, (with E. Golowich and B.R. Holstein), *Physics Reports* **131** #'s 5 and 6 (1986) p. 319-428.
65. Dispersive effects in  $D^0$  -  $D^0$  mixing (with E. Golowich, B.R. Holstein and J. Trampetic), *Phys. Rev.* **D33**, 179 (1986).
66. The quark content of the proton, (with C. Nappi), *Phys. Lett.* **168B**, 105 (1986).
67. Is  $D^0 \rightarrow \phi K^0$  really a clear signal for the annihilation diagram?, *Phys. Rev.* **D33**, 1516 (1986).
68. A new four quark operator—the dipenguin (with E. Golowich and G. Valencia) *Phys. Rev.* **D33**, 1387 (1986).
69. Chiral symmetry, nonleptonic hyperon decay and the Feinberg-Kabir-Weinberg theorem (with B.R. Holstein), *Phys. Rev.* **D33**, 2717 (1986).

70. The lifetime of a deeply bound H dibaryon and the Cygnus X-3 events (with E. Golowich and B.R. Holstein) Phys. Lett. **174B**, 441 (1986).
71. Quantum mechanics in curved space (with B.R. Holstein), Am. J. Phys. **54**, 827 (1986).
72. Gravitational coupling at finite temperature (with B.R. Holstein and R.W. Robinett), Phys. Rev. **D34**, 1208 (1986).
73. Hyperon decays and CP nonconservation (with X.G. He and S. Pakvasa), Phys. Rev. **D34**, 833 (1986).
74. Chiral perturbation theory corrections to  $K_L \rightarrow \gamma\gamma$  (with B.R. Holstein and Y.-C.R. Lin), Nuc. Phys. **B277**, 651 (1986).
75. Electromagnetic and isospin breaking decrease  $\epsilon'/\epsilon$  (with E. Golowich, B.R. Holstein and J. Trampetic) Phys. Lett. **B179**, 361 (1986).
76. CP violation in low energy  $p\bar{p}$  Reactions (with B.R. Holstein and G. Valencia), Phys. Lett. **178**, 319 (1986).
77. Weak decays of the H dibaryon (with E. Golowich and B.R. Holstein) Phys. Rev. **D34**, 3434 (1986).
78. Searching for CP violation in jet physics (with G. Valencia) Phys. Rev. Lett. **58**, 451 (1987).
79. KM angles and SU(3) breaking in hyperon beta decay (with B.R. Holstein and S. Klimt), Phys. Rev. **D35**, 934 (1987).
80. Aristotle was right: Heavier objects do fall faster (with B.R. Holstein), Europhysics Journal **8**, 105 (1987).
81.  $K_L \rightarrow \pi^0 e^+ e^-$  as a probe of CP violation, (with B.R. Holstein and G. Valencia), Phys. Rev. **D35**, 2769 (1987).
82. CP violation in  $K \rightarrow 3\pi$  (with B.R. Holstein and G. Valencia), Phys. Rev. **D36**, 798 (1987).
83. Survey of present and future tests of CP violation (with B.R. Holstein and G. Valencia), Int. J. of Mod. Phys. **A2**, 319 (1987).
84. The effect of  $B^0 B^0 - \bar{B}^0$  mixing on searches for CP violation (with T. Nakada, E.A. Paschos and D. Wyler) Phys. Lett. **195B**, 285 (1987).
85. The harmonic oscillator via functional techniques (with B.R. Holstein) Am. J. Phys. **56**, 216 (1988).
86. B meson decays and the Weinberg Higgs model of CP violation (with E. Golowich), Phys. Rev. **D37**, 2542 (1988).

87. Electric dipole moments of nuclei, (with B.R. Holstein and M.J. Musolf) Phys. Lett. **196B**, 196 (1987).
88. The reaction  $\gamma\gamma\rightarrow\pi^0\pi^0$  and chiral loops (with B.R. Holstein and Y.C. Lin) Phys. Rev. **D38**, 2423 (1988).
89. Diquark clusters in the quark gluon plasma (with K.S. Sateesh) Phys. Rev. **D38**, 360 (1988).
90.  $\pi\pi$  scattering and chiral lagrangians, (with C. Ramariz and G. Valencia) Phys. Rev. **D38**, 2195 (1988).
91. Gravitational and inertial mass and the finite temperature equivalence principle, (with B.R. Holstein) Euro J. Phys., **10**, 72 (1989), 285.
92. Stability of hot curved space, (with P. Gribovsky and B.R. Holstein) Ann. Phys., (NY) **190**, 149 (1989).
93. Spectrum of QCD and chiral lagrangians of the strong and weak interaction, Phys. Rev., **D39**, 1947 (1989).
94. One loop renormalization of the Wess Zumino Witten anomaly lagrangian, (with D. Wyler) Nucl. Phys., **B316**, 289 (1989).
95. Pion transitions and models of chiral symmetry, (with B.R. Holstein) Phys. Rev., **D40**, 2378 (1989).
96. Kaon decays and predictions of chiral symmetry, (with B.R. Holstein) Phys. Rev. **D40**, 3700 (1989).
97. Semileptonic  $b\rightarrow u$  decay, (with C. Ramirez and G. Burdman) Phys. Rev., **D41**, 1496 (1990).
98. Symmetry breaking and WW scattering, (with C. Ramirez) Phys. Lett. **B234**, 361 (1990).
99. Isospin breaking and the precise determination of  $|V_{ud}|$ , (with D. Wyler) Phys. Lett. **241B**, 243 (1990).
100. Decay of a light Higgs boson, (with J. Gasser and H. Leutwyler) Nucl. Phys. **B343**, 341 (1990).
102. Chiral symmetry and the large  $N_C$  limit in  $K/4$  decays, (with C. Riegenbach, J. Gasser, and B.R. Holstein) Phys. Rev. **D43**, 127 (1990).
103. Energy and momentum in chiral theories, (with H. Leutwyler) Zeit. Phys. C, **53**, 343 (1991).

104. Reliable prediction in exclusive rare B decay, (with G. Burdman) Phys. Lett., **270B**, 55 (1991).
105. B meson CP violation without flavor identification", (with G. Burdman) Phys. Rev. **D45**, 187 (1992).
106. Light quark masses beyond leading order, (with D. Wyler) Phys. Rev. **D45**, 892 (1992).
107. Chiral symmetry tests in nonleptonic K decay, (with J. Kambor, B. Holstein, J. Missimer and D. Wyler) Phys. Rev. Lett. **68**, 1818 (1992).
108. Union of chiral and heavy quark symmetries, (with G. Burdman) Phys. Lett. (1992).
109. Two component semileptonic form factors, (with G. Burdman) Phys. Rev. Lett. **68**, 2887 (1992).
110. Components of a chiral coefficient, (with B. Holstein) Phys. Rev. **D46**, 4076-4081 (1992).
111. Mass ratios of light quarks, (with B. Holstein and D. Wyler) Phys. Rev. Lett. **69**, 3444-3447 (1992).
112. Quantum correlations in three body  $\phi$  decay, (with B. Holstein and A. Perez) Z. Phys. **C58**, 313-317 (1993).
113. Electromagnetic self energies of pseudoscalar mesons and Dashen's theorem, (with B. Holstein and D. Wyler) Phys. Rev. **D47**, 2089-2097 (1993).
114. Equivalence theorem and global anomalies, (with J. Tandean) Phys. Lett. **B301**, 372-375 (1993).
115.  $\gamma\gamma$  scattering, chiral symmetry and pion polarizabilities, (with B. Holstein) Phys. Rev. **D48**, 137-146 (1993).
116. "Leading Quantum Corrections to the Newtonian Potential", Phys. Rev. Letters, **72**, 2996-2999 (1994).
117. The Reactions  $\gamma\gamma \rightarrow W_L^+ W_L^-$  and  $\gamma\gamma \rightarrow Z_L Z_L$  in SU(N) Strongly Interacting Theories, (with T. Torma) Nucl. Phys. **B424**, 399-417 (1994).
118. Anatomy of a weak matrix element, (with E. Golowich) Phys. Lett. **B315**, 406-411 (1993).
119. Chiral sum rules and their phenomenology, (with E. Golowich) Phys. Rev. **D49**, 1513-1525 (1994).
120. General Relativity as an Effective Field Theory: The Leading Quantum Corrections, Phys. Rev. **D50**, 3874 (1994).
121. Reanalysis of the Decay  $K_L \rightarrow \pi^0 e^+ e^+$ , (with F. Gabbiani) Phys. Rev. **D51**, 2187 (1995).

122. Global Anomalies and the Gauge Boson Equivalence Theorem, (with J. Tandean) Phys. Lett. **B361**, 69 (1995).
123. Is  $B \rightarrow X_s \gamma$  equal to  $b \rightarrow s \gamma$ ? Spectator contributions to rare inclusive B decays, (with A. Petrov) Phys. Rev. **D53**, 3664 (1996).
124. On the power counting of loop diagrams in general relativity, (with T. Torma) Phys. Rev. **D54**, 4963, (1996).
125. Systematics of soft final state interactions in B decay, (with E. Golowich, A. Petrov, and J. Soares) Phys. Rev. Lett. **77**, 2178, (1996).
126. Final State Rescattering as a Contribution to  $B \rightarrow \rho \gamma$ , (with E. Golowich, and A. Petrov) Phys. Rev. **D55**, 2657 (1997).
127. Factorization in Nonleptonic Decays of Heavy Mesons, (with A. Petrov) Phys. Lett. **B393**, 149 (1997).
128. The Electromagnetic Mass Differences of Pions and Kaons, (with A. Perez) Phys. Rev. **D55**, 7075 (1997).
129. Asymptotic Limits and Structure of the Pion Form-Factor, (E.S. Na) Phys. Rev. **D56**, 7073 (1997).
130.  $K(L) \rightarrow \pi^0 \gamma e^+ e^-$  and It's Relation to CP and Chiral Tests, (with F. Gabbiani) Phys. Rev. **D56**, 1605 (1997).
131. The Anthropic Principle and the Mass Scale of the Standard Model, (with V. Agrawal, S.M. Barr and D. Seckel) Phys. Rev. **D57**, 5480 (1998).
132. The Weight for Random Quark Masses, Phys. Rev. **D57**, 5499 (1998).
133. Anthropic considerations in Multiple Domain Theories and the Scale of Electroweak Symmetry Breaking, (with V. Agrawal, S.M. Barr and D. Seckel), Phys. Rev. Lett. **80**, 1822 (1998).
134. Improving the Convergence of SU(3) Baryon Chiral Perturbation Theory, (with B. Holstein) hep-ph/9803312, 12pp (1998).
135. Chiral Predictions for  $K(L) \rightarrow \pi^0 \gamma \mu^+ \mu^-$ , (with F. Gabbiani) Phys. Rev. **D58**, 37504, 6pp (1998).
136. SU(3) Baryon Chiral Perturbation Theory and Long Distance Regularization, (with B. Holstein and B. Borasoy) hep-ph/9804281, 31 pp. Phys.Rev.**D59**:036002 (1999) .
137. Infrared Behavior of Graviton-graviton Scattering, (with Tibor Torma) 12pp. hep-th/9901156, Phys.Rev.**D60**:024003 (1999)



138. The Leading Chiral Electromagnetic Correction to the Nonleptonic  $\Delta I = 3/2$  Amplitude in Kaon Decays. (with V. Cirigliano and E. Golowich). hep-ph/9810488 Phys.Lett.**B450**:241-249 (1999)
139. Electromagnetic Corrections to  $K \rightarrow \pi\pi$ . 1. Chiral Perturbation Theory, (with Vincenzo Cirigliano and Eugene Golowich). 19pp. hep-ph/9907341 Phys.Rev.**D61**:093001 (2000), Erratum-ibid.**D63**:059903 (2001)
140. Electromagnetic Corrections to  $K \rightarrow \pi\pi$ . 2. Dispersive Matching. (with Vincenzo Cirigliano and Eugene Golowich). 26pp. hep-ph/9909473 Phys.Rev.**D61**:093002 (2000)
141. Dispersive Calculation of  $B_7^{(3/2)}$  AND  $B_8^{(3/2)}$  in the Chiral Limit. (with Eugene Golowich). hep-ph/9911309 Phys.Lett.**B478**:172-184 (2000)
142. Random Values of the Cosmological Constant 15pp. hep-ph/0006088, JHEP **0008**:022 (2000)
143. Dimension Eight Operators in the Weak Operator Product Expansion (with Vincenzo Cirigliano and Eugene Golowich). : hep-ph/0007196 21pp. JHEP **0010**:048 (2000)
144.  $K \rightarrow \pi\pi$  Phenomenology in the Presence of Electromagnetism. (with Vincenzo Cirigliano and Eugene Golowich ). hep-ph/0008290, Eur.Phys.J.**C18**:83-95 (2000)
145. Spatial Gradients in the Cosmological Constant.. 12pp. e-Print Archive: hep-ph/0101130, JHEP **0303**:052 (2003)
146. Determination of  $\langle (\pi\pi)_{I=2} | Q_{(7,8)} | K^0 \rangle$  in the Chiral Limit. (with Vincenzo Cirigliano, Eugene Golowich and Kim Maltman), Sep 2001. hep-ph/0109113, Phys.Lett.**B522**:245-256 (2001)
147. Quantum corrections to the Reissner-Norrdstrom and Kerr-Newman metrics, (with Barry R. Holstein, Bjorn Garbrecht, and Thomas Konstandin) Phys.Lett.**B529**:132-142 (2002) e-Print Archive: hep-th/0112237
148. Quantum corrections to the Schwarzschild and Kerr metrics. (with Niels Emil Jannik Bjerrum-Bohr and Barry R. Holstein) Phys.Rev.**D68**:084005 (2003) e-Print Archive: hep-th/0211071
149. Quantum gravitational corrections to the nonrelativistic scattering potential of two masses (with N.E.J Bjerrum-Bohr and Barry R. Holstein) Phys.Rev.**D67**:084033 (2003) e-Print Archive: hep-th/0211072
150. Improved determination of the electroweak penguin contribution to  $\epsilon'/\epsilon$  in the chiral limit. (with Vincenzo Cirigliano, Eugene Golowich and Kim Maltman),. **Phys.Lett.B555**:71-82 (2003) e-Print Archive: hep-ph/0211420

151. Long distance chiral corrections in B meson amplitudes. (with Juan J. Sanz-Cillero and Andreas Ross) Phys.Lett.**B579**:86-98 (2004) e-Print Archive: hep-ph/0305181.
152. Dynamics of M-theory vacua, Phys.Rev.**D69**:106012 (2004), Erratum-ibid.D69:129901 (2004). e-Print Archive: hep-th/0310203
153. Classical physics and quantum loops, (with Barry R Holstein), Phys.Rev.Lett.**93**:201602 (2004) e-Print Archive: hep-th/0405239
154. Isotropy of the early universe from CMB anisotropies, (with Evan P. Donoghue) Phys.Rev.**D71**:043002 (2005) e-Print Archive: astro-ph/0411237
155. Long distance effects and strangeness in the nucleon. (with Barry R. Holstein, Tobias Huber and Andreas Ross) Fizika **B14**, 217 (2005) e-Print Archive: hep-ph/0412035
156. Quark and lepton masses and mixing in the landscape (with Koushik Dutta and Andreas Ross) Phys.Rev. **D73**, 113002 (2006). e-Print Archive: hep-ph/0511219
157. Sigma exchange in the nuclear force and effective field theory. Phys.Lett. **B643**, 165 (2006) e-Print Archive: nucl-th/0602074
158. The nuclear central force in the chiral limit. Phys. Rev. **C74**, 024002 (2006), e-Print Archive: nucl-th/0603016
159. On the parameterization dependence of the energy momentum tensor and the metric (with N.E.J Bjerrum-Bohr and B. R. Holstein) Phys.Rev.**D75**:108502 (2007) e-Print Archive: gr-qc/0610096
160. Non-isotropy of the CMB power spectrum in single field inflation (with Koushik Dutta and Andreas Ross) Phys. Rev **D80**, 023526 (2009) e-Print Archive astro-ph/0703455
161. Constraints on the variability of quark masses from nuclear binding (with T. Damour) Phys.Rev.**D78**:014014(2008) arXiv hep-ph 0712:2968
162. Likely values of the Higgs vacuum expectation value (with K. Dutta, A. Ross and M. Tegmark , arXiv:0903.1024 [hep-ph] (submitted to Physical Review)
163. Gauge federation as an alternative to unification (with P. Pais) arXiv:0903.3929 [hep-ph], Phys. Rev. **D79**, 095020 (2009)
164. Comments on the minimal vectorial Standard Model (with M. Anber, U. Aydemir and P. Pais), Phys. Rev. **D80**, 015012 (2009), arXiv:0905.4260 [hep-ph]
165. Regge kinematics in SCET, (with D. Wyler)

### **C. Books:**

1. **Dynamics of the Standard Model**, (with E. Golowich and B.R. Holstein) Cambridge Univ. Press, (1992) 584 pages. [Paperback edition (1994)].
2. **CP Violation and the Limits of the Standard Model (TASI 1994)** , ed. by J.F. Donoghue, (World Scientific, Singapore, 1995) 781 pages.

### **D. Impact Factors:**

(from Spires, 7/28/09)

Total citations = 9973

Average citations per published paper = 60

h-index = 59