

Robert L. Jaffe

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PERSONAL

Born May 23, 1946 in Bath, Maine; United States Citizenship
Married to Diana M. Bailey, Principle of Diana Bailey Architecture, Inc.
Two children: Rebecca Caroline and Samuel Pryor

EDUCATION

Stanford University 1968–1972
Ph.D. (Physics) 1972
M.S. (Physics) 1971

Princeton University 1964–1968
A.B. *summa cum laude* (Physics) and Valedictorian 1968

Public Schools, Stamford, Connecticut 1951–1964

PROFESSIONAL EXPERIENCE

Massachusetts Institute of Technology
Morningstar Professor of Physics 2000–PRESENT
Margaret MacVicar Faculty Fellow 1998–PRESENT
Director of the Center for Theoretical Physics 1998–2004
Professor of Physics and Chairman of the Faculty 1993–1995
Professor of Physics 1983–PRESENT
Associate Professor of Physics 1978–1983
Assistant Professor of Physics 1974–1978
Research Associate 1972–1974

Stanford Linear Accelerator Center
Research Associate 1972

VISITING POSITIONS

RIKEN/BNL Research Center, Brookhaven National Laboratory,
Senior Visiting Scientist 1997–1998
Harvard University, *Visiting Professor* 1995–1996
Boston University, *Visiting Professor* 1985–1986
Oxford University, *SERC Senior Visiting Fellow at the
Department of Theoretical Physics* 1983
Beijing University, *Visiting Lecturer* 1981
CERN, *Scientific Associate* 1979
Oxford University, *Senior Visiting Fellow at the Department of
Theoretical Physics and Fellow of St. Catherine's College* 1979
California Institute of Technology, *Visiting Associate in Theoretical Physics* 1976
Stanford Linear Accelerator Center, *Visiting Scientist* 1976

SELECTED PROFESSIONAL ACTIVITIES

- ◆ Fellow, American Association for the Advancement of Science
- ◆ Fellow, American Physical Society
- ◆ Lahore University of Management and Science, School of Science and Engineering, Advisory Committee (2005–PRESENT) Chairman (2006–2007)
- ◆ Brookhaven Science Associates, Science and Technology Steering Committee (1998–PRESENT) Chairman (2005–PRESENT)
- ◆ AGS and RHIC Program Advisory Committee, Brookhaven National Laboratory (1996–2006)
- ◆ Overseer, Boston Museum of Science (1995–2004)
- ◆ Program Advisory Committee, Boston Museum of Science (1994–2004)
- ◆ Board of Directors, Future Problem Solvers of Massachusetts (1996–2000)
- ◆ Brookhaven National Laboratory Physics, ADD, AGS, NSLS and Instrumentation Visiting Committee (1992–1995)
- ◆ Editorial Board, Springer-Verlag, *Lecture Notes in Physics* (1990–PRESENT)
- ◆ Organizer: Santa Fe QCD Study Group (1989–1993)
- ◆ Cofounder and Codirector: The Symposium at MIT (1987–1989)
- ◆ Associate Editor, *Nuclear Physics B* (1987–PRESENT)
- ◆ Physics Department Advisory Council, Princeton University (1986–1999), Chairman (1992–1998)
- ◆ AGS Program Advisory Committee, Brookhaven National Laboratory (1986–1990)
- ◆ Consultant, Los Alamos National Laboratory (1985–1995)
- ◆ Editorial Board, *Physical Review D* (1984–1986)
- ◆ Experimental Program Advisory Committee, Stanford Linear Accelerator Center (1983–1987)
- ◆ Brookhaven National Laboratory Physics and Accelerator Department Visiting Committee (1980)
- ◆ Executive Committee of the Division of Particles and Fields of the American Physical Society (1979–1980)
- ◆ MIT Press Editorial Board (1976–1984)
- ◆ Founder: Stanford Workshops on Political and Social Issues (1969)

FELLOWSHIPS

- ◆ Residency at the Rockefeller Foundation Study Center at Bellagio, Italy (2004)
- ◆ A. P. Sloan Foundation Fellow (1975–1979)
- ◆ Woodrow Wilson Foundation Fellow (1968–1970)
- ◆ National Science Foundation Predoctoral Fellow (1968–1971)

INSTITUTE ACTIVITIES

- ◆ Physics Council (1998–2004)
- ◆ Department of Physics Teaching Coordinator (1998–2000)
- ◆ Committee on the Undergraduate Program (1998–2001) – Chairman (2000–2001)
- ◆ Advisory Committee to the Office of Minority Education (1997–1999)
- ◆ Executive Committee for the Laboratory for Nuclear Science (1996–2004)
- ◆ Blue Ribbon Panel on the MIT Medical Department (1995–1996)

- ◆ MIT Committee on Campus Race Relations (1994–1998)
- ◆ Chairman of the MIT Faculty (1993–1995)
- ◆ Faculty Policy Committee (1992–1995) – Chairman (1993–1995)
- ◆ Steering Committee on the Strategic Review of Benefits (1992–1995)
- ◆ Corporation Joint Advisory Committee (1992–1995)
- ◆ Committee on the Undergraduate Program (1992–1994)
- ◆ Science Council Prize Committee (1988–1991)
- ◆ Wellesley-MIT Joint Committee – Chairman (1987–1990)
- ◆ Committee on Faculty Administration (1987–1990)
- ◆ Physics Department Education Committee (1986–2000)
- ◆ Symposium at MIT – Cofounder and member (1986–1994)
- ◆ Physics Department Committee on the Allocation of Teaching Resources
– Chairman (1985–1986)
- ◆ School of Science Education Committee (1985–1988)
- ◆ Institute Committee on Educational Policy (1984–1985)
- ◆ Board of Directors of Technology Children’s Center (1983–1986)

INSTITUTE HONORS AND PRIZES

- ◆ Otto and Jane Morningstar Professor of Physics (2000)
- ◆ Margaret MacVicar Faculty Fellow (1998)
- ◆ Physics Department Buechner Teaching Prize (1997)
- ◆ Graduate Student Council Teaching Award (1988)
- ◆ Science Council Prize for Excellence in Teaching Undergraduates (1982–1983)

SUBJECTS LECTURED

- ◆ Quantum Mechanics II (8.05)
Fall 2003
- ◆ Quantum Mechanics III (8.059)
Spring 1998, Spring 2002
- ◆ Quantum Mechanics II & III (8.05/59)
Fall 1996–Spring 1997
- ◆ Quantum Mechanics (8.04/5)
Fall 1988–Spring 1989
- ◆ Mechanics II (8.06)
Spring 1982, Spring 1983, Spring 1992, Spring 1993
- ◆ Electrodynamics II (8.07)
Fall 1975, Fall 1976, Fall 1978
- ◆ Modern Physics (8.09/8.10)
Fall 1990–Spring 1991, Fall 1991–Spring 1992
- ◆ Relativity (8.20)
IAP 1992, IAP 1993, IAP 2003, IAP 2004
- ◆ Quantum Theory I & II (8.321/8.322)
Fall 1984–Spring 1985, Fall 1987–Spring 1988, Fall 2005–Spring 2006,
Fall 2006–Spring 2007
- ◆ Relativistic Quantum Field Theory (8.323)
Fall 1977, Fall 1980

BRIEF BIOGRAPHICAL SKETCH

Robert L. Jaffe is the Otto and Jane Morningstar Professor of Physics at MIT.

Jaffe is best known for his research on the quark substructure of matter. In the early 1970s he and his colleagues at MIT formulated the first consistent description of quark confinement, the “MIT Bag Model”. Together with John Ellis of CERN, Jaffe formulated a sum rule which relates polarized lepton scattering to the spin substructure of the nucleon. Tests of this sum rule sparked a renewal of interest in the hadron spin physics. His recent work in this area (in collaboration with Xiangdong Ji of the University of Maryland) includes the elucidation of the “transversity”, a novel quark spin observable accessible in hard scattering experiments. He has been deeply involved in the development of the spin physics program at Brookhaven National Lab. Jaffe also began the systematic study of exotic hadrons in the 1970s. He proposed that the scalar (spinless) mesons should be interpreted as two quark, two antiquark states, an interpretation which has only recently won wide acceptance. He and Kenneth Johnson (at MIT) launched the theory of glueballs – hadrons made entirely of the gluons which mediate confining forces. Together with Edward Farhi (also at MIT), Jaffe first described the properties of strange quark matter and explored its significance in astrophysics.

In the late 1990’s Jaffe, Farhi, and collaborators developed analytical and computational tools for the study of quantum vacuum energies – Casimir energies – with applications to problems ranging from micromachinery to beyond the Standard Model. Recently this work has taken a practical turn: In collaboration with Antonello Scardicchio (MIT, now Princeton) and Mehran Kardar (MIT), Jaffe developed powerful practical methods to determine the geometry dependence of Casimir forces as they affect micro-electro-mechanical systems (MEMS). Most recently, in collaboration with Thorsten Emig (CNRS-Saclay), Noah Graham (Middlebury), and Kardar, Jaffe has developed practical methods to compute electromagnetic Casimir forces and torques between compact objects of arbitrary shapes whether perfect conductors or dielectrics. This work promises to revolutionize the calculation of Casimir forces.

Jaffe continues to work on the physics of quarks and hadrons. In 2003 Jaffe and Frank Wilczek (MIT) reconsidered the importance of di-quark correlations in quantum chromodynamics. In 2005 and 2006 Jaffe and collaborators explored the importance of parity doubling in hadron spectroscopy, and categorized *ordinary* and *extraordinary* resonances in QCD.

Professor Jaffe received his AB, summa cum laude in Physics from Princeton, where he was Valedictorian of the Class of 1968. He received his MS and PhD degrees from Stanford in 1971 and 1972, respectively. At Stanford he founded the Stanford Workshops on Political and Social Issues.

In 1972 Jaffe came to MIT as a postdoctoral research associate in the Center for Theoretical Physics. He joined the faculty in 1974. From 1975 until 1979, he was an A. P. Sloan Foundation Research Fellow. Professor Jaffe has spent sabbatical years at the Stanford Linear Accelerator Center (1976), Oxford University and the European Center for Nuclear Research (1978–9), at Boston University (1986–7), and at Harvard University (1996–7). In 2004 Jaffe was a resident scholar at the Rockefeller Foundation Study Center at Bellagio, Italy. He has served on the program advisory committees of several national laboratories and for many years he was the chairman of the Advisory Council of the Physics Department of Princeton University. He now serves as Chair of the Science and Engineering Steering Committee of Brookhaven National Laboratory and a member of the Brookhaven Science Associates Board of Directors. Since 1996 he has been an advisor to and Visiting Scientist at the RIKEN-Brookhaven Research Center. Jaffe is a Fellow of the American Physical Society and the American Association for the Advancement of Science. He has been awarded the Science Council Prize for Excellence in Teaching Undergraduates (1983), the Graduate Student Council Teaching Award (1988), and the Physics Department Buechner Teaching Prize (1997). In January 1998, Jaffe was named a Margaret MacVicar Faculty Fellow (1998) in recognition of his contributions to MIT’s

teaching program. Since 2005 Jaffe has been collaborating on the development of a new private university of science and technology in Lahore Pakistan, as a member and chair of their external advisory committee. The new Lahore University of Management and Science, School of Science and Engineering will admit its first freshman class in the Fall of 2008.

Jaffe has been very active in MIT affairs. He was cofounder of the Symposium at MIT, an interdisciplinary faculty program dedicated to improving communication and the exchange of ideas within the faculty. He has served as chairman of MIT's Committee on the Undergraduate Program and its Faculty Policy Committee. In 1992 he was elected to a term as Chair of the MIT Faculty which concluded in June of 1995.

In 2000 Jaffe was named to the Morningstar Chair in MIT's School of Science.

SELECTED RESEARCH PUBLICATIONS

1. CASIMIR FORCES BETWEEN ARBITRARY COMPACT OBJECTS (with T. Emig, N. Graham and M. Kardar), **cond-mat/07071862**.
2. CASIMIR INTERACTION BETWEEN A PLATE AND A CYLINDER (with T. Emig, M. Kardar and A. Scardicchio), (2006) **cond-mat/0601055**.
3. DIQUARKS AND EXOTIC SPECTROSCOPY (with F. Wilczek), *Phys Rev Lett* **91** 232003, (JUL 2003), **hep-th/0307341**.
4. CASIMIR ENERGIES IN LIGHT OF QUANTUM FIELD THEORY (with N. Graham, V. Khemani, M. Quandt, M. Scandurra and H. Weigel), *Phys Lett B* **572** (2003) 196, **hep-th/00207205**.
5. CALCULATING VACUUM ENERGIES IN RENORMALIZABLE QUANTUM FIELD THEORIES: A NEW APPROACH TO THE CASIMIR PROBLEM (with N. Graham, V. Khemani, M. Quandt, M. Scandurra, and H. Weigel), *Nucl Phys B* **645** (2002) 49, **hep-th/0207120**.
6. QUANTUM ENERGIES OF INTERFACES (with N. Graham, M. Quandt, and H. Weigel), *Phys Rev Lett* **87** (2001) 131601, **hep-th/0103010**.
7. ENERGY, CENTRAL CHARGE, AND THE BPS BOUND FOR (1+1)-DIMENSIONAL SUPERSYMMETRIC SOLITONS (with N. Graham), *Nucl Phys B* **544** (1999) 432, **hep-th/9808140**.
8. FINITE QUANTUM FLUCTUATIONS ABOUT STATIC FIELD CONFIGURATIONS (with E. Farhi, N. Graham, and P. Haagensen), *Phys Lett* **B427** (1998) 334, **hep-th/9802015**.
9. INTERFERENCE FRAGMENTATION FUNCTIONS AND THE NUCLEON'S TRANSVERSITY (with X. Jin and J. Tang), *Phys Rev Lett* **80** (1998) 1166, **hep-ph/9709322**.
10. QCD SELECTION RULES IN POLARIZED HADRON COLLISIONS (with N. Saito), *Phys Lett* **B382** (1996) 165, **hep-ph/9604220**.
11. BOUND STATES IN TWISTING TUBES (with J. Goldstone), *Phys Rev B* **45** (1992) 14100.
12. CHIRAL ODD PARTON DISTRIBUTIONS AND POLARIZED DRELL-YAN (with Xiangdong Ji), *Phys Rev Lett* **67** (1991) 552.
13. THE g_1 PROBLEM: DEEP INELASTIC ELECTRON SCATTERING AND THE SPIN OF THE PROTON (with A. Manohar), *Nucl Phys B* **337** (1990) 509.
14. g_2 : THE NUCLEON'S OTHER SPIN-DEPENDENT STRUCTURE FUNCTION, *Comm Nucl Part Phys* **14** (1990) 239.
15. STRANGER THAN FICTION: THE STRANGENESS RADIUS AND MAGNETIC MOMENT OF THE NUCLEON, *Phys Lett* **B229** (1989) 275.
16. QUALITATIVE FEATURES OF THE GLUEBALL SPECTRUM (with K. Johnson and Z. Ryzak), *Ann Phys* **168** (1986) 344.
17. STRANGE MATTER (with E. Farhi), *Phys Rev D* **30** (1984) 2379.
18. THE BARYON NUMBER IN CHIRAL QUARK MODELS (with J. Goldstone), *Phys Rev Lett* **51** (1983) 1518.
19. PARTON DISTRIBUTION FUNCTIONS FOR TWIST-FOUR, *Nucl Phys B* **229** (1983) 205.
20. QUARK DISTRIBUTIONS IN NUCLEI, *Phys Rev Lett* **50** (1983) 228.
21. NORMALIZING THE RENORMALIZATION GROUP ANALYSIS OF DEEP INELASTIC LEPTOPRODUCTION (with G. G. Ross), *Phys Lett* **93B** (1980) 313.

22. THE CONNECTION BETWEEN QUARK MODEL EIGENSTATES AND LOW-ENERGY SCATTERING (with F. E. Low), *Phys Rev D* **19** (1979) 2105.
23. UNCONFINED QUARKS AND GLUONS (with A. De Rujula and R. C. Giles), *Phys Rev D* **17** (1978) 285.
24. PERHAPS A STABLE DIHYPERON, *Phys Rev Lett* **38** (1977) 195, 617E.
25. MULTIQUARK HADRONS I and II, *Phys Rev D* **15** (1977) 267, 281.
26. UNCONVENTIONAL STATES OF CONFINED QUARKS AND GLUONS (with K. Johnson), *Phys Rev* **60B** (1975) 201.
27. MASSES AND OTHER PARAMETERS OF THE LIGHT HADRONS (with T. A. DeGrand, K. Johnson and J. Kiskis), *Phys Rev D* **12** (1975) 2060.
28. BARYON STRUCTURE IN THE BAG THEORY (with A. Chodos, K. Johnson and C. Thorn), *Phys Rev D* **10** (1974) 2599.
29. A NEW EXTENDED MODEL OF HADRONS (with A. Chodos, K. Johnson, C. Thorn and V. F. Weisskopf), *Phys Rev D* **9** (1974) 3471.
30. A SUM RULE FOR DEEP INELASTIC ELECTROPRODUCTION FROM POLARIZED PROTONS (with J. Ellis), *Phys Rev D* **9** (1973) 1444.

RECENT PUBLICATIONS FOR NON-SPECIALISTS

1. TIMES OF OUR LIVES in *Natural History*, NOVEMBER 2006.
2. AS TIME GOES BY in *Natural History*, OCTOBER 2006.
3. QUARKS, DIQUARKS, AND PENTAQUARKS in *Physics World*, JUNE 2004.

COMPLETE LIST OF PUBLICATIONS

211. OPTICAL-APPROXIMATION ANALYSIS OF SIDEWALL-SPACING EFFECTS ON THE FORCE BETWEEN TWO SQUARES WITH PARALLEL SIDEWALLS (with S. Zaheer, A. Rodriguez and S. Johnson), **arXiv:0709.0699** [quant-ph].
210. CASIMIR FORCES BETWEEN ARBITRARY COMPACT OBJECTS (with T. Emig, N. Graham and M. Kardar), **arXiv:0707.1862** [cond-mat], *Phys Rev Lett* (to be published).
209. CASIMIR FORCES IN A PISTON GEOMETRY AT ZERO AND FINITE TEMPERATURES (with M. P. Hertzberg, M. Kardar and A. Scardicchio), *Phys Rev D* **76** (2007) 045016, **arXiv:0705.0139** [quant-ph].
208. ORDINARY AND EXTRAORDINARY HADRONS, talk presented at the 2006 Yukawa International Seminar: *New Frontiers in QCD*, Kyoto University, November 2006, **hep-ph/0701038**.
207. PION DECOUPLING AND SU(2)_L x SU(2)_R RESTORATION IN THE HADRON SPECTRUM (with D. Pirjol and A. Scardicchio), *Phys Rev D* **74** (2006) 057901 .
206. LIFE AND DEATH AMONG THE HADRONS, *AIP Conf Proc* **792** (2005) 97.
205. PARITY DOUBLING AMONG THE BARYONS, *Phys Rept* **435** (2006) 157, **hep-ph/0602010**.
204. CASIMIR INTERACTION BETWEEN A PLATE AND A CYLINDER (with T. Emig, M. Kardar and A. Scardicchio), *Phys Rev Lett* **96** (2006) 080403, **cond-mat/0601055**.
203. WHY MASSLESS PIONS PRECLUDE SU(2)_L x SU(2)_R RESTORATION IN THE HADRON SPECTRUM (with D. Pirjol and A. Scardicchio), *Phys Rev Lett* **96** (2006) 121601, **hep-ph/0511081**.
202. CASIMIR FORCES IN A CLOSED GEOMETRY (with M. P. Hertzberg, M. Kardar, A. Scardicchio), *Phys Rev Lett* **95** (2005) 250402, **quant-ph/0509071**.
201. VERNON HUGHES AND THE QUEST FOR THE PROTON'S SPIN *Prepared for Memorial Symposium in Honor of Vernon Willard Hughes, New Haven, Connecticut, 14-15 Nov 2003*.
200. COLOR NON-SINGLET SPECTROSCOPY, *Phys Rev D* **72** (2005) 074508, **hep-ph/0507149**.
199. CASIMIR EFFECTS: AN OPTICAL APPROACH II. LOCAL OBSERVABLES AND THERMAL CORRECTIONS (with A. Scardicchio), *Nucl Phys B* **743** (2006) 249, **quant-ph/0507042**.
198. THE CASIMIR EFFECT AND THE QUANTUM VACUUM, *Phys Rev D* **72** (2005) 021301, **hep-th/0503158**.
197. CASIMIR BUOYANCY (with A. Scardicchio), *JHEP* **0506** (2005) 006, **hep-th/0501171**.
196. THE CASIMIR ENERGY FOR A HYPERBOLOID FACING A PLATE IN THE OPTICAL APPROXIMATION (with O. Schroeder and A. Scardicchio), *Phys Rev A* **72** (2005) **012105**, **hep-th/0412263**.
195. EXOTICA, *Phys Reports* **409** (2005) 1; *Nucl Phys Proc Suppl* **142** (2005) 343, **hep-ph/0409065**.
194. QUARKS, DIQUARKS AND PENTAQUARKS (with F. Wilczek), *Phys World* **17** (2004) 25.
193. IMPLICATIONS OF THE PRESENT BOUND ON THE WIDTH OF THE $\Theta(1540)^+$ (with A. Jain), *Phys Rev D* **71** (2005) 034012, MIT-CTP-3523, **hep-ph/0408046**.
192. CASIMIR EFFECTS: AN OPTICAL APPROACH I. FOUNDATIONS AND EXAMPLES (with A. Scardicchio), *Nucl Phys B* **704** (2005) 552, **quant-ph/0406041**.
191. COMMENT ON hep-ph/0404212 ON 'EXOTIC ANTI-DECUPLET OF BARYONS: PREDICTION FROM CHIRAL SOLITONS', **hep-ph/0405268**.
190. CASIMIR EFFECTS: FROM THE TABLETOP TO THE STANDARD MODEL, *Acta Phys Polon B* **34** (2003) 5691.

189. COMMENT ON 'EXOTIC ANTI-DECUPLET OF BARYONS: PREDICTIONS FROM CHIRAL SOLITONS', *Eur Phys J C* **35** (2004) 221, **hep-ph/0401187**.
188. A PERSPECTIVE ON PENTAQUARKS (with F. Wilczek), *Eur Phys J C* **33** (2004) S38, **hep-ph/0401034**.
187. SYSTEMATICS OF EXOTIC CASCADE DECAYS (with F. Wilczek), *Phys Rev D* **69** (2004) 114017, **hep-ph/0312369**.
186. THE CASIMIR EFFECT AND GEOMETRIC OPTICS (with A. Scardicchio), *Phys Rev Lett* **92** (2004) 070402, **quant-ph/0310194**.
185. THE DIRICHLET CASIMIR PROBLEM (with N. Graham, V. Khemani, M. Quandt, O. Schroeder and H. Weigel), *Nucl Phys B* **677** (2004) 379, **hep-th/0309130**.
184. THE CASIMIR EFFECT FOR FERMIONS IN ONE DIMENSION (with P. Sundberg), *Annals Phys* **309** (2004) 442, **hep-th/0308010**.
183. DIQUARKS AND EXOTIC SPECTROSCOPY (with F. Wilczek), *Phys Rev Lett* **91** (2003) 232003, **hep-th/0307341**.
182. UNNATURAL ACTS: UNPHYSICAL CONSEQUENCES OF IMPOSING BOUNDARY CONDITIONS ON QUANTUM FIELDS, *AIP Conf Proc* **687** (2003) 3, **hep-th/0307014**.
181. SCALAR MESONS AS ANTI-Q2 Q2 INSIGHT FROM THE LATTICE (with M. Alford), Talk given at High-Energy Physics Workshop on Scalar Mesons: An Interesting Puzzle for QCD, Utica, New York, 16-18 May 2003. *AIP Conf Proc* **688** (2004) 208, **hep-lat/0306037**.
180. CASIMIR EFFECTS: FROM GROUNDED PLATES TO THE STANDARD MODEL, *Prepared for Continuous Advances in QCD 2002 / ARKADYFEST (honoring the 60th birthday of Prof. Arkady Vainshtein), Minneapolis, Minnesota, 17-23 May 2002*.
179. HEAVY FERMION QUANTUM EFFECTS IN $SU(2)_L$ GAUGE THEORY (with E. Farhi, N. Graham, V. Khemani and H. Weigel), *Nucl Phys B* **665** (2003) 623, **hep-th/0303159**.
178. QUANTUM MECHANICS ON MANIFOLDS EMBEDDED IN EUCLIDEAN SPACE (with P.C. Schuster), *Ann Phys* **307** (2003) 132-143 **hep-th/0302216**.
177. CASIMIR ENERGIES IN LIGHT OF QUANTUM FIELD THEORY (with N. Graham, V. Khemani, M. Quandt, M. Scandurra and H. Weigel), *Phys Lett B* **572** (2003) 196, **hep-th/0207205**.
176. CALCULATING VACUUM ENERGIES IN RENORMALIZABLE QUANTUM FIELD THEORIES: A NEW APPROACH TO THE CASIMIR PROBLEM (with N. Graham, V. Khemani, M. Quandt, M. Scandurra, and H. Weigel), **hep-th/0207120**.
175. CASIMIR EFFECTS IN RENORMALIZABLE QUANTUM FIELD THEORIES (with N. Graham and H. Weigel), *Int J Mod Phys A* **17** (2002) 846, **hep-th/0201148**.
174. OPEN QUESTIONS IN HIGH ENERGY SPIN PHYSICS, *Int J Mod Phys A* **18** (2003) 1141, **hep-ph/0201068**.
173. SEARCHING FOR QUANTUM SOLITONS IN A (3+1)-DIMENSIONAL CHIRAL YUKAWA MODEL (with E. Farhi, N. Graham, and H. Weigel), *Nucl Phys B* **630** (2002) 241, **hep-th/0112217**.
172. DELOCALIZATION OF THE AXIAL CHARGE IN THE CHIRAL LIMIT, *Phys Lett B* **529** (2002) 105, **hep-ph/010815**.
171. GETTING TO KNOW YOUR CONSTITUENTS, *SLAC Beam Line* **30N2** (2000) 34.
170. FINITE ENERGY SUM RULES IN POTENTIAL SCATTERING (with N. Graham, M. Quandt, and H. Weigel), *Ann Phys* **293** (2001) 240, **quant-ph/0104136**.
169. QUANTUM ENERGIES OF INTERFACES (with N. Graham, M. Quandt, and H. Weigel), *Phys Rev Lett* **87** (2001) 131601, **hep-th/0103010**.

168. THE SPIN STRUCTURE OF THE NUCLEON: THEORETICAL OVERVIEW, *Physics with an Electron Polarized Light-Ion Collider*, R. Milner, ed., (AIP Conference Proceedings 588, Melville, NY, 2001), 54, **hep-ph/0102281**.
167. SPIN: PROGRESS AND PROSPECTS, *Spin 2000: 14th International Spin Physics Symposium*, K. Hatanaka, T. Nakano, K. Imai, and H. Ejin, eds., (AIP Conference Proceedings 570, Melville, NY, 2001), **hep-ph/0101280**.
166. THE THEORY OF THE NUCLEON SPIN, *Phil Trans Roy Soc Lond* **A359** (2001) 391, **hep-ph/0008038**.
165. FRACTIONAL AND INTEGER CHARGES FROM LEVINSON'S THEOREM (with E. Farhi, N. Graham, and H. Weigel), *Nucl Phys B* **595** (2001) 536, **hep-th/0007189**.
164. HEAVY FERMION STABILIZATION OF SOLITONS IN (1+1)-DIMENSIONS (with E. Farhi, N. Graham, and H. Weigel), *Nucl Phys B* **585** (2000) 443, **hep-th/0003144**.
163. INSIGHT INTO THE SCALAR MESONS FROM A LATTICE CALCULATION (with M. Alford), *Nucl Phys B* **578** (2000) 367, **hep-lat/0001023**.
162. COLOR, SPIN, AND FLAVOR-DEPENDENT FORCES IN QUANTUM CHROMODYNAMICS, *The Gregory Breit Centennial Symposium* (World Scientific, Singapore, 2001), 125, **hep-th/0001123**, V. Hughes, F. Iachello, D. Kusnezov, eds.
161. A HEAVY FERMION CAN CREATE A SOLITON: A (1+1)-DIMENSIONAL EXAMPLE (with E. Farhi, N. Graham, and H. Weigel), *Phys Lett* **B475** (2000) 335, **hep-th/9912283**.
160. REVIEW OF SPECULATIVE 'DISASTER SCENARIOS' AT RHIC (with W. Busza, J. Sandweiss, and F. Wilczek), *Rev Mod Phys* **72** (2000) 1125, **hep-ph/9910333**.
159. THE CASIMIR ENERGY IN A SEPARABLE POTENTIAL (with L.R. Williamson), *Ann Phys* **282** (2000) 432, **hep-th/9907199**.
158. CHI(2) PRODUCTION IN POLARIZED P P COLLISIONS AT RHIC: MEASURING DELTA G AND TESTING THE COLOR OCTET MODEL (with D. Kharzeev), *Phys Lett* **B455** (1999) 306, **hep-th/9903280**.
157. DIRAC PARTICLES IN TWISTED TUBES (with P. Ouyang and V. Mohta), *Ann Phys* **275** (1999) 297, **hep-th/9901108**.
156. FERMIONIC ONE LOOP CORRECTIONS TO SOLITON ENERGIES IN (1+1) DIMENSIONS (with N. Graham), *Nucl Phys B* **549** (1999) 516, **hep-th/9901023**.
155. ONE THEORIST'S PERSPECTIVE ON FOUR ERAS OF ELECTRON PROTON SCATTERING, talk given at the Sid Drell Symposium, Stanford, CA, 31 July 1998, **hep-ph/9811327**.
154. ENERGY, CENTRAL CHARGE, AND THE BPS BOUND FOR (1+1)-DIMENSIONAL SUPERSYMMETRIC SOLITONS (with N. Graham), *Nucl Phys B* **544** (1999) 432, **hep-th/9808140**.
153. UNAMBIGUOUS ONE LOOP QUANTUM ENERGIES OF (1+1)-DIMENSIONAL BOSONIC FIELD CONFIGURATIONS (with N. Graham), *Phys Lett* **B435** (1998) 145, **hep-th/9805150**.
152. QUARK AND GLUON ORBITAL ANGULAR MOMENTUM AND SPIN IN HARD PROCESSES (with S. Bashinskii), *Nucl Phys B* **536** (1998) 303, **hep-ph/9804397**.
151. FINITE QUANTUM FLUCTUATIONS ABOUT STATIC FIELD CONFIGURATIONS (with E. Farhi, N. Graham, and P. Haagsen), *Phys Lett* **B427** (1998) 334, **hep-th/9802015**.
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INVITED CONFERENCE PRESENTATIONS

158. “Casimir Forces between Arbitrary Compact Objects: Origins and Implications” at Quantum Field Theory under the Influence of External Conditions (QFEXT07), Leipzig, Sept 2007 (invited speaker).
157. “Gluon Spin Basics” at the International School of Physics “Enrico Fermi” *Strangeness and Spin in Fundamental Physics*, Varenna, Italy, June 2007 (invited lecturer).
156. “Ordinary and Extraordinary Hadrons” at *QCD@Work*, Bari, Italy, June 2007 (invited speaker).
155. “Casimir energies, stresses, and forces: When are they well defined and how can they be estimated?” at the workshop: *Dispersion Forces and Nano-Electro-Mechanical Systems* at the Lorentz Center, Leiden, The Netherlands, Dec 2006 (invited speaker).
154. “Ordinary and Extraordinary Hadrons” at the Yukawa International Symposium (YKIS) 2006, *New Frontiers in QCD — Exotic Hadrons and Hadronic Matter*, Kyoto, Nov 2006 (invited speaker).
153. “What is the Point: A Perspective on 21st Century Science, at the Conference *Running Hot! Science in New Zealand*, Christchurch, New Zealand, Nov 2006 (keynote speaker).
152. “Neglected Symmetry: Parity Doubling among the Baryons”, at the Conference on the Intersections between Particle and Nuclear Physics (CIPANP) 2006, Puerto Rico, May 2006 (invited speaker).
151. “Neglected Symmetry: Parity Doubling among the Baryons”, at the 7th workshop *Continuous Advances in QCD*, Minnesota, May 2006 (invited speaker).
150. “Exotic Spectroscopy,” at the 4th Circum-Pan-Pacific Spin Conference, INT University of Washington, Seattle, Washington (invited speaker) August 2003.
149. “Three Mysteries of QCD” at the Workshop on Hadron Structure at J-PARC, Tsukuba, Japan (invited speaker), (November 2005).
148. “Color Non-Singlet Spectroscopy” at *Pentaquark 2005*, Jefferson Lab, Newport News, VA (invited speaker), (October 2005).
147. “Casimir Physics” at the 12th Irish Quantum Field Theory Meeting, Dublin, Ireland (invited speaker), (May 2005).
146. “Multiquark Dynamics” Lectures at the 10th LNF Spring School, “Bruno Touschek”, Frascati, Italy (invited lecturer), (May 2005).
145. “Life and Death Among the Hadrons,” at *DIS05*, Madison, WI (invited speaker), (April 2005).
144. “On Vector Dominance” at *Hadrons and Strings*, ECT*, Trento, Italy (invited speaker), (July 2004).
143. “Targets of Opportunity for String Theory: Unexplained Dynamical Regularities of QCD” at *Hadrons and Strings*, ECT*, Trento, Italy (invited speaker), (July 2004).
142. “Exotica” at *Hadrons and Strings*, ECT*, Trento, Italy (invited speaker), (July 2004).
141. “The Interpretation of Recently Reported Exotic Baryons” at *BEACH04*, Chicago, IL (invited speaker), (June 2004).
140. “Quarks in Hadrons” at the JLab Annual Users Group Meeting, Newport News, VA (invited speaker), (June 2004).
139. “Exotica,” at *Continuous Advances in QCD 2004* University of Minnesota, Minneapolis, MN (invited speaker), (May 2004).

138. “Gluon Spin Basics,” at *Workshop on Hadron Structure and Spectroscopy*, Paris, France (invited speaker), (March 2004).
137. “Diquarks, Tetraquarks Pentaquarks, A Re-examination of Exotics in QCD” at *Multi-quark Hadrons; four, five and more?*, Kyoto, Japan (invited speaker), (February 2004).
136. “Diquarks, Tetraquarks, Pentaquarks: Exotic Hadrons in QCD,” at *Quark Matter 2004*, Berkeley, CA (invited speaker), (January 2004).
135. “Exotic Spectroscopy,” at the 4th Circum-Pan-Pacific Spin Conference, INT University of Washington, Seattle, Washington (invited speaker) August 2003.
134. “Gluon Spin Basics,” at the 4th Circum-Pan-Pacific Spin Conference, INT University of Washington, Seattle, Washington (invited speaker) August 2003.
133. “Implications of an Exotic Baryon,” at the Gordon Conference, Waterville, ME (invited speaker) July 2003.
132. “The Casimir Effect: From the Tabletop to the Standard Model,” at the Crakow School of Theoretical Physics, Zakopane, Poland (invited lecturer) June 2003.
131. “Strangeness,” at the Conference on the Intersections of Nuclear and Particle Physics, New York, NY (invited speaker) May 2003.
130. “Insight into the Scalar Mesons from a Lattice Calculation,” at the workshop: Scalar Mesons: an Interesting Puzzle for QCD, SUNY Institute of Technology, Utica, NY (invited speaker) May 2003.
129. “Unnatural Acts: Unphysical Consequences of Imposing Boundary Conditions on Quantum Fields,” at the 25th Annual Montreal-Rochester-Syracuse-Toronto Conference on High Energy Physics, ”JoeFest”, Syracuse University (invited speaker) May 2003.
128. “Unsolved Mysteries of QCD”, at the INT Workshop o QCD and String Theory, Institute for Nuclear Theory, University of Washington, Seattle, Washington (invited speaker), February 2003.
127. “What’s the Matter with Strangeness?” at the International Workshop on Parity Violation, Mainz, Germany, (opening speaker) June 2002.
126. “Casimir Effects: From Grounded Plates to the Standard Model,” at the Workshop on Continuous Advances in QCD2002/Arkadyfest, honoring the 60th Birthday of Arkady Vainshtein, Theoretical Physics Institute, University of Minneapolis, MN (opening speaker) May 2002.
125. “QCD Spin Physics: From the Allotropes of Hydrogen to the Polarized Collider at RHIC,” at the Brookhaven Spin Physics Celebration, Brookhaven National Laboratory, NY (invited speaker) April 2002.
124. “Fundamental Physics from Transversity,” at the European Workshop on The QCD Structure Of The Nucleon: QCD-N’02, Ferrara, Italy (invited speaker) April 2002.
123. “Physics of the Nucleon Spin,” at the Electron Ion Collider Workshop, Brookhaven National Laboratory, NY (opening speaker) February 2002.
122. “Open Questions in QCD Spin Physics” at The 3rd Circum-Pan-Pacific Symposium on High Energy Spin Physics, Peking University, Beijing, China (opening speaker) May 2001.
121. “The Unusual Role of the Strange Quark in QCD ” at the Herman Feshbach Memorial Symposium, MIT, Cambridge, MA (invited speaker) May 2001.
120. “Quantum Energies of Interfaces” at Quantum Field Theory under the Influence of External Conditions, Leipzig, Germany (invited speaker), September 2001.

119. “Open questions in spin physics” at the International workshop on the spin structure of the proton and polarized collider physics, ECT*, Trento, Italy (invited speaker), July 2001.
118. “High Energy Spin Physics” at the “Vernon Hughes Celebraton”, Yale, New Haven, CT (invited speaker), May 2001.
117. “White Paper on RHIC Spin” at the Brookhaven Town Meeting, BNL, Brookhaven, Upton, NY (invited speaker), January 2001.
116. “Open Questions in QCD Spin Physics” at the 3rd Circum-Pan-Pacific Symposium “High Energy Spin Physics”, Beijing, China (opening speaker), October 2000.
115. “Spin: Progress and Prospects” at the 14th International Spin Physics Symposium, SPIN 2000, Osaka, Japan (opening speaker), October 2000.
114. “The Spin Structure of the Nucleon: Theoretical Overview” at the Workshop on Physics with an Electron Polarized Light-Ion Collider, Cambridge, MA (invited speaker), June 2000.
113. “Transversity” at the Frascati National Laboratory Spring School, Frascati, Italy (invited speaker), May–June 2000.
112. “Theory of the Nucleon Spin” at the Royal Society Discussion Meeting, “The Quark Structure of Matter”, London, UK (invited speaker), May 2000.
111. “ransversity” at the RIKEN/BNL Workshop on Transverse Spin Physics, BNL, Brookhaven, Upton, NY (invited speaker), March 2000.
110. “Color, Spin, and Flavor-Dependent forces in Quantum Chromodynamics” at the Gregory Breit Centennial Symposium, Yale, New Haven (invited speaker), October 1999.
109. “Probing the Nucleon at RHIC” at the RHIC Dedication Ceremony, BNL, Brookhaven, Upton, NY (invited speaker), October 1999.
108. “Angular Momentum in QCD” at the International Workshop Challenges in QCD, Kfar Giladi, Israel (invited speaker), June 1999.
107. “Open questions in Spin Theory and the RHIC Spin program” at the Conference on Polarized Protons at High Energies - Accelerator Challenges and Physics Opportunities, DESY, Hamburg, Germany (opening theory speaker), May 1999.
106. “Parton Angular Momentum” at the 7th International Workshop on Deep-Inelastic Scattering and QCD (DIS 99), DESY-Zeuthen, Germany (invited speaker), April 1999.
105. “Theoretical Overview of Transversity and Transverse Observables” at the Transverse Physics Workshop at DESY-Zeuthen, Germany (opening speaker), April 1999.
104. RIKEN Winter School, Shimoda, Ito, Japan (principal lecturer), December 1998.
103. Annual Meeting of the Division of Nuclear Physics of the Physical Society, Santa Fe, NM (invited speaker), October 1998.
102. Sid Drell Conference, SLAC, Stanford (invited speaker), July 1998.
101. Santa Fe Workshop “Perturbative and non-Perturbative Aspects of the Standard Model”, Santa Fe, NM (invited lecturer) August 1998.
100. Workshop on “Deep Inelastic Nonforward and Forward Lepton-Nucleon Scattering”, and Graduiertenkolleg, Regensburg, Germany (invited lecturer) July 1998.
99. Third Workshop on Continuous Advances in QCD, University of Minnesota, Minneapolis, MN (invited speaker), May 1998.
98. Hadron Physics in the 21st Century, Washington, DC (invited speaker), March 1998.

97. DESY Zeuthen Workshop “Deep Inelastic Scattering off Polarized Targets: Theory Meets Experiment”, DESY, Zeuthen, Berlin, Germany (invited speaker), September 1997.
96. CTEQ Summer School, Lake Como, WI (invited lecturer), May 1997.
95. CERN Workshop on the Strange Structure of the Nucleon (opening theory speaker), March 1997.
94. TJNAF Workshop on “Deep-Inelastic Structure of Nuclei” (summary speaker), December 1996.
93. Workshop on Collider Physics, GSI, Darmstadt, Germany (keynote speaker), June 1996.
92. DIS96 Workshop: Deep Inelastic Scattering and Related Phenomena, University of Rome (invited speaker), April 1996.
91. Institute for Theoretical Physics, Minneapolis, symposium on Continuous Advances in QCD, Minneapolis, Minnesota (invited speaker), March 1996.
90. RIKEN Symposium on the Spin Structure of the Nucleon, Tokyo, Japan, (keynote speaker) December 1995.
89. ICTP Trieste Workshop: Trends in Collider Spin Physics, Trieste, Italy, (keynote speaker), December 1995
88. 1995 Erice School on the Spin Structure of the Nucleon, Erice, Sicily, Italy (principal lecturer), August 1995.
87. APS/AAPT Joint Meeting, University of Connecticut, Storrs (principal speaker), April 1995.
86. Internal Spin Structure of the Nucleon, Yale, New Haven (principal speaker), January 1994.
85. Workshop on Physics at HERA with Internal Targets, DESY, Hamburg (principal speaker), September 1993.
84. Workshop on Perspectives of High Energy Strong Interaction Physics at Hadron Facilities, Fermilab (invited speaker), August 1993.
83. QCD in Nuclear Physics, Gordon Conference, Tilton, New Hampshire (principal speaker), July 1993.
82. Annual United Kingdom Particle Theory Meeting, Rutherford Laboratory (invited speaker), December 1992.
81. Explorations in Theoretical Physics, Lectures in Honor of Francis Low on the Occasion of his 70th Birthday, MIT, Cambridge (principal speaker), December 1992.
80. 10th International Symposium on High Energy Spin Physics, Nagoya, Japan (principal speaker), November 1992.
79. Institute for Advanced Study of the University of Indiana (fellow), October–November 1992.
78. QCD and Hadron Structure – Graduiertenkolleg, Kloster Banz, Staffelstein, Germany (principal lecturer), June 1992.
77. Baryon '92 – International Conference on the Structure of Baryons and Related Mesons, Yale, New Haven (principal speaker) June 1992.
76. SLAC Workshop on High Energy Electroproduction and Spin Physics, SLAC, Stanford (principal speaker), February 1992.
75. International Symposium on Hypernuclear and Strange Particle Physics, Shimoda, Japan (principal speaker), December 1991.

74. Spin Muon Collaboration Annual Meeting, Paris, France (principal speaker), December 1991.
73. Symposium in Honor of Professor Kenneth Johnson, MIT, Cambridge, MA (principal speaker), November 1991.
72. Sante Fe QCD Study Group, Sante Fe, NM (founder, organizer and participant), July/August 1991.
71. Gordon Research Conference QCD IN NUCLEAR PHYSICS, Tilton, NH (principal speaker), July 1991.
70. Strange Quark Matter in Physics and Astrophysics, Aarhus, Denmark (principal speaker), May 1991.
69. American Physical Society Washington Meeting, Joint Symposium of the Division of Nuclear Physics and Particles and Fields (invited speaker), April 1991.
68. Workshop on High Energy Probes of QCD and Nuclei, Pennsylvania State University, State College (invited speaker), March 1992.
67. International Conference on Spin and Isospin in Nuclear Interactions, Telluride, Colorado (invited speaker), March 1991.
66. Hadronic Physics with Electrons Beyond 10 GeV, Dourdan, France (invited speaker), October 1990.
65. Sante Fe QCD Study Group, Sante Fe, NM (founder, organizer and participant), July/August 1990.
64. Paris '90: VII International Conference on Polarization Phenomena in Nuclear Physics (principal speaker), July 1990).
63. QCD '90, Montpellier, France (invited speaker), July 1990).
62. Nuclear Physics in the 1990's: A Symposium in Honor of Akito Arima (invited speaker), May 1990.
61. Workshop on Hadron Structure Functions and Parton Distributions, Fermilab (invited speaker), April 1990.
60. School on Fundamental Physics and Cosmology, Islamabad, Pakistan (principal lecturer), March 1990.
59. PASCOS-90 The First International Symposium on Particles, Strings and Cosmology, Boston (invited speaker), March 1990.
58. DPF 90: Annual Meeting of the Division of Particles and Fields of the Physical Society, Rice University, Houston, TX (invited speaker), January 1990.
57. Workshop on High Energy Electro-Nuclear Physics, Asilomar, CA (invited speaker), October 1989.
56. Sante Fe QCD Study Group, Sante Fe, NM (founder, organizer and participant), August 1989.
55. Baltimore Meeting of the American Physical Society (invited speaker), May 1989.
54. Topical Conference on Electronuclear Physics with Internal Targets, SLAC (invited speaker), January 1989.
53. Los Alamos Workshop on Nuclear and Particle Physics on the Light Cone, Los Alamos (invited speaker), August 1988.
52. First European Workshop on Hadron Physics in the 1990's with Multi-GeV Electrons, Seillac, France (opening speaker), June 1988.

51. Third Conference on the Intersections of Particle and Nuclear Physics (conference summary speaker), May 1988.
50. International Conference on Physics and Astrophysics of Quark-Gluon Plasma (ICPA-QGP), Bombay (principal speaker), February 1988.
49. Topical Seminar, *Hadrons and Structure of Matter*, Moscow (invited speaker), November 1987.
48. IX PANIC Meeting on the Intersections of Particle and Nuclear Physics, Kyoto, Japan (opening speaker), April 1987.
47. Workshop on Nuclear Physics with Internal Targets at SLAC (invited participant and lecturer), January 1987.
46. Quantum Chromodynamics: Successes in Particle, Perspectives for Nuclear Physics, Trieste (principal lecturer), September 1986.
45. SLAC Summer Institute Topical Conference Special Session in Honor of the Sixtieth Birthday of Sidney Drell (principal speaker), August 1986.
44. Institute of Theoretical and Experimental Physics, Moscow (invited visitor and lecturer), June 1986.
43. IX Warsaw Symposium on Elementary Particle Physics, Kazimierz, Poland (lecturer), May 1986.
42. First Workshop on Antimatter Physics at Low Energies, Fermilab (opening speaker), April 1986.
41. XII European Conference on the Physics and Chemistry of Complex Nuclear Reactions, Neve Ilan, Israel (invited speaker), October 1985.
40. Institute for Theoretical Physics (UCSB) Workshop on Nuclear Chromodynamics (invited participant), August 1985.
39. Los Alamos Workshop on Relativistic Dynamics and Quark-Nuclear Physics (principal lecturer), June 1985.
38. New Particles '85, Madison, Wisconsin (invited speaker), May 1985.
37. XX Rencontre de Moriond, *QCD and Beyond* (conference summary speaker), March 1985.
36. Bevelac Physical Sciences User Meeting (invited speaker), February 1985.
35. VII High Energy Heavy Ion Study, GSI Darmstadt (invited speaker), October 1984.
34. VII European Symposium on Antiproton Interactions (opening speaker), July 1984.
33. Workshop on Weak Interaction Symmetry Breaking at SSC Energies, Berkeley (invited participant), June 1984.
32. Nuclear Structure Gordon Conference (lecturer), August 1983.
31. Virginia Polytechnic Institute and State University Summer Workshop in Particle theory (principal lecturer), August 1983.
30. Fourth United Kingdom Summer Institute in Theoretical Particle Physics (principal lecturer), July–August 1983.
29. Washington Meeting of the American Physical Society – General Interest Session of the Division of Nuclear Physics (invited speaker), April 1983.
28. University of Washington Summer Institute (invited participant and lecturer), July 1982.
27. Tonji University, Shanghai, China (visiting scientist and lecturer), December 1981.

26. Peking University, Beijing, China (visiting scientist and lecturer), October–November 1981.
25. Summer School in Quantum Field Theory, Les Houches (lecturer), August 1981.
24. Lepton-Photon Symposium, Bonn, FRG (rapporteur), August 1981.
23. Aspen Center for Physics (visiting scientist), July–August 1981.
22. XX International Conference on High Energy Physics, Madison, Wisconsin (parallel session speaker and organizer), July 1980.
21. Washington Meeting of the American Physical Society – General Interest Session of the division of Nuclear Physics (invited speaker), April 1980.
20. April 1980 XIX Schladming Winter School, Schladming, Austria (principal lecturer), March 1980.
19. Interactional School of Subnuclear Physics “Ettore Majorana,” Erice (principal lecturer), July–August 1979.
18. Rutherford Laboratory Workshop on Quantum Chromodynamics (invited speaker), May 1979.
17. Symposium on Multiquark Spectroscopy – Nijmegen (principal speaker), January 1979.
16. PHYSICS AT HIGH ENERGIES, A Symposium in Celebration of the 100th Anniversary of the University of Stockholm (principal speaker), September 1978.
15. XIII Rencontre de Moriond, *Phenomenology of Quantum Chromodynamics* (invited speaker), March 1978.
14. Annual Meeting of the American Physical Society in San Francisco (invited speaker), January 1978.
13. Rutherford Laboratory Workshop on Baryonium Physics (invited speaker), January 1978.
12. S LAC Summer Institute Topical Conference on Quark and Lepton Spectroscopy (lecturer), July 1977.
11. Aspen Center for Physics (visiting scientist), June–July 1977.
10. Particles and Fields 1976, APS Division of Particles and Fields Annual Meeting, Brookhaven (invited speaker), October 1976.
9. Topical Conference on Baryon Resonances, Oxford (invited speaker), July 1976.
8. XI Rencontre de Moriond, New Fields in Hadronic Physics, (invited speaker), March 1976.
7. Aspen Center for Physics (visiting scientist), Summer 1975.
6. Aspen Center for Physics (visiting scientist), Summer 1974.
5. Moscow Seminar on Quark and Parton Problems (invited speaker), Summer 1974.
4. University of California (Santa Cruz) Summer School in High Energy Physics (principal lecturer), Summer 1973.
3. New York Academy of Sciences Conference, Recent Advances in Particle Physics, (invited speaker), March 1973.
2. International School of Subnuclear Physics, “Ettore Majorana,” (participant, lecturer, Racah Prize Scholarship), July–August 1972.
1. Scottish Universities Summer School in High Energy Physics (participant), Summer 1970.