

Peer-Reviewed Publications of Alan M. Nathan

1. J. R. Comfort, A. M. Nathan, W. J. Braithwaite, and J. R. Duray. Proton-induced reactions on ^{89}Y . *Phys. Rev. C* **11**, 2012-2021 (1975).
2. T. E. Kalogeropoulos, D. N. Michael, D. I. Lowenstein, A. M. Nathan, N. P. Samios, and A. Z. Schwarzschild. Search for structure in the γ -ray spectra from $p'd$ and $p'p$ annihilations at rest. *Phys. Rev. Lett.* **35**, 824-827 (1975).
3. A. M. Nathan, G. T. Garvey, P. Paul, and E. K. Warburton. M1 decay rates and second-class currents in mass 8. *Phys. Rev. Lett.* **35**, 1137-1140 (1975)
4. A. M. Nathan and J. J. Kolata. Spins and lifetimes of yrast states in ^{40}Ca . *Phys. Rev. C* **14**, 171-180 (1976).
5. A. M. Nathan and D. E. Alburger. Mass and beta decay of ^{34}Si . *Phys. Rev. C* **15**, 1448-1452 (1977).
6. A. M. Nathan, J. W. Olness, E. K. Warburton, and J. B. McGrory. Yrast decay schemes from heavy ion + ^{48}Ca fusion-evaporation reactions. I. $^{54-56}\text{Mn}$, ^{56}Cr , and $^{52-53}\text{V}$. *Phys. Rev. C* **16**, 192-214 (1977).
7. E. K. Warburton, J. W. Olness, A. M. Nathan, J. J. Kolata, and J. B. McGrory. Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. II. $^{59-60}\text{Fe}$ and $^{59-60}\text{Co}$. *Phys. Rev. C* **16**, 1027-1039 (1977).
8. A. M. Nathan, D. E. Alburger, J. W. Olness, and E. K. Warburton. The beta decay of $^{54-55}\text{V}$ and the mass of ^{55}V . *Phys. Rev. C* **16**, 1566-1575 (1977).
9. K. P. Lieb, A. M. Nathan, and J. W. Olness. Deorientation of highly stripped Ca and K ions recoiling in vacuo. *Hyperfine Interactions* **5**, 113-126 (1978).
10. D. E. Alburger and A. M. Nathan. Beta-ray branching and half-lives of ^{12}B and ^{12}N . *Phys. Rev. C* **17**, 280-286 (1978).
11. A. M. Nathan, J. W. Olness, E. K. Warburton, and J. B. McGrory. Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. III. $^{57,58}\text{Fe}$, $^{54,55}\text{Cr}$, and $^{57,58}\text{Mn}$. *Phys. Rev. C* **17**, 1008-1025 (1978).
12. E. K. Warburton, J. W. Olness, A. M. Nathan, and A. R. Poletti. Yrast decay schemes from heavy-ion + ^{48}Ca fusion-evaporation reactions. IV. ^{53}Cr , ^{54}V , ^{62}Co , and $^{61-63}\text{Ni}$. *Phys. Rev. C* **18**, 1637-1650 (1978).
13. A. M. Sandorfi and A. M. Nathan. Structure in the radiative capture of ^{12}C by ^{12}C near the Coulomb barrier. *Phys. Rev. Lett.* **40**, 1252-1255 (1978).
14. T. J. Bowles, R. J. Holt, H. E. Jackson, R. M. Laszewski, A. M. Nathan, et al. Direct observation of elastic and inelastic photon scattering by the giant dipole resonance in ^{60}Ni . *Phys. Rev. Lett.* **41**, 1095-1097 (1978). Erratum: *Phys. Rev. Lett.* **41**, 1523 (1978).
15. A. M. Nathan, R. Starr, R. M. Laszewski, and P. Axel. Parity of bound $J=1$ levels in ^{208}Pb . *Phys. Rev. Lett.* **42**, 221-224 (1979).

16. A. M. Nathan and R. Moreh. Inadequacy of the dynamic collective model in describing inelastic photon scattering in ^{166}Er . *Phys. Lett.* **91B**, 38-40 (1980).
17. A. M. Nathan, R. M. Laszewski, T. J. Bowles, R. J. Holt, et al. Photon scattering studies of the giant dipole resonance in medium weight nuclei. *Phys. Rev. C* **24**, 1940-1951 (1981).
18. A. M. Nathan, A. M. Sandorfi, and T. J. Bowles. Intermediate-structure fusion resonances observed in the radiative capture of ^{12}C by ^{12}C . *Phys. Rev. C* **24**, 932-943 (1981).
19. A. M. Sandorfi, M. T. Collins, D. J. Millener, A. M. Nathan, and S. F. LeBrun. Evidence for giant E 2 transitions in high-energy α -particle capture. *Phys. Rev. Lett.* **46**, 884-887 (1981).
20. T. J. Bowles, R. J. Holt, H. E. Jackson, R. D. McKeown, A. M. Nathan, and J. R. Specht. Isospin splitting of the giant dipole resonance in ^{60}Ni . *Phys. Rev. Lett.* **48**, 986-989 (1982).
21. D. H. Wright, A. M. Nathan, L. J. Morford, and P. T. Debevec. Elastic photon scattering and the E2 strength function in carbon and calcium. *Phys. Rev. Lett.* **52**, 244-246 (1984).
22. D. H. Wright, P. T. Debevec, L. J. Morford, and A. M. Nathan. Elastic photon scattering from carbon and calcium and its interpretation. *Phys. Rev. C* **32**, 1174-1186 (1985).
23. A. M. Nathan, P. L. Cole, P. T. Debevec, S. D. Hoblit, S. F. LeBrun, and D. H. Wright. Photon scattering from ^{206}Pb . *Phys. Rev. C* **34**, 480-488 (1986).
24. S. F. LeBrun, A. M. Nathan, and S. D. Hoblit. Photon scattering in the giant dipole resonance region of ^{16}O . *Phys. Rev. C* **35**, 2005-2010 (1987).
25. R. Alarcon, R. M. Laszewski, A. M. Nathan, and S. D. Hoblit. Photon scattering from ^{90}Zr below neutron emission threshold. *Phys. Rev. C* **36**, 954-958 (1987).
26. Y. Birenbaum, R. Alarcon, S. D. Hoblit, R. M. Laszewski, and A. M. Nathan. Photon scattering on ^{238}U and the interpretation of near-threshold photofission resonances. *Phys. Rev. C* **36**, 1293-1297 (1987).
27. D. S. Dale, A. M. Nathan, F. J. Federspiel, S. D. Hoblit, J. Hughes, and D. Wells. Elastic photon scattering in ^{209}Bi : Meson exchange contributions to the dipole sum and the orbital g factor. *Phys. Lett. B* **214**, 329-333 (1988).
28. A. M. Nathan. Coupling of the giant dipole resonance to gamma vibrations. *Phys. Rev. C* **38**, 92-99 (1988).
29. R. Alarcon, A. M. Nathan, S. F. LeBrun, and S. D. Hoblit. Photon scattering in the giant resonance region of ^{24}Mg , ^{28}Si , and ^{32}S . *Phys. Rev. C* **39**, 324-330 (1989).
30. H. H. Pitz, R. D. Heil, U. Kneissl, S. Lindenstruth, U. Seeman, R. Stock, C. Wesselborg, A. Zilges, P. von Bretane, S. D. Hoblit, and A. M. Nathan. Low energy photon scattering off $^{142,146,148,150}\text{Nd}$: and investigation in the mass region of a nuclear shape transition. *Nucl. Phys. A* **509**, 587 (1990).
31. W. Wilke, U. Kneissl, T. Weber, H. Ströher, L. S. Cardman, P. T. Debevec, S. D. Hoblit, R. T. Jones, and A. M. Nathan. Photofission of ^{238}U with monochromatic gamma rays in the energy range 11-16 MeV. *Phys. Rev. C* **42**, 2148-2156 (1990).

32. J. R. Beene, F. E. Bertrand, D. J. Horen, J. L. Lisantti, M. L. Halbert, D. C. Hensley, W. Mittig, Y. Schutz, J. Barrete, N. Alamanos, F. Auger, B. Fernandez, A. Gillibert, B. Haas, J. P. Vivien, and A. M. Nathan. Compound and precompound effects in photon decay of the giant dipole resonance. *Phys. Rev. C [Rapid Commun.]* **41**, 1332 (1990).
33. D. Delli Carpini, E. C. Booth, J. P. Miller, R. Igarashi, J. Bergstrom, H. Caplan, M. Doss, E. Hallin, C. Rangacharyulu, D. Skopik, M. A. Lucas, A. M. Nathan, and D. Wells. Coherent photon scattering cross sections for helium near the delta resonance. *Phys. Rev. C* **43**, 1525-1531 (1991).
34. S. D. Hoblit and A. M. Nathan. Photon decay modes of the giant dipole resonance in even-A Nd isotopes. *Phys. Rev. C* **44**, 2372-2384 (1991).
35. A. M. Nathan. Statistical and nonstatistical photon emission from giant resonances. *Phys. Rev. C [Rapid Commun.]* **43**, 2479-2482 (1991).
36. M. Thoennessen, J. R. Beene, F. E. Bertrand, D. J. Horen, M. L. Halbert, D. C. Hensley, J. E. Lisantti, W. Mittig, Y. Schutz, N. Alamanos, F. Auger, J. Barrette, B. Fernandez, A. Gillibert, B. Haas, J. P. Vivien, and A. M. Nathan. High-energy target excitations in heavy ion inelastic scattering. *Phys. Rev. C [Rapid Commun.]* **43**, 12 (1991).
37. F. J. Federspiel, R. A. Eisenstein, M. A. Lucas, B. E. MacGibbon, K. Mellendorf, A. M. Nathan, A. O'Neill, and D. P. Wells. The proton Compton effect: A measurement of the electric and magnetic polarizabilities of the proton. *Phys. Rev. Lett.* **67**, 1511-1514 (1991).
38. D. P. Wells, D. S. Dale, R. A. Eisenstein, F. J. Federspiel, M. A. Lucas, K. E. Mellendorf, A. M. Nathan, and A. E. O'Neill. Elastic photon scattering from ^4He : The charge symmetry problem. *Phys. Rev. C* **46**, 449-454 (1992).
39. L. D. Pham, S. Holbraten, R. P. Redwine, D. R. Tiegues, G. van der Steenhoven, K. E. Wilson, M. E. Yuly, F. J. Federspiel, R. A. Eisenstein, A. M. Nathan, S. A. Wood, and E. J. Biese. Exclusive $^{16}\text{O}(\gamma, \pi^-p)$ reaction in the Δ resonance region. *Phys. Rev. C* **46**, 621-626 (1992).
40. C. A. Bertulani and A. M. Nathan. Excitation and photon decay of giant resonances from high energy collisions of heavy ions. *Nucl. Phys.* **A554**, 158-172 (1993).
41. E. L. Hallin, D. Amendt, J. C. Bergstrom, H. S. Caplan, R. Igarashi, D. M. Skopik, E. C. Booth, D. Delli Caripini, J. P. Miller, F. J. Federspiel, B. E. MacGibbon, and A. M. Nathan. Compton scattering from the proton. *Phys. Rev. C* **48**, 1497-1507 (1993).
42. N. C. Mukhopadhyay, A. M. Nathan, and L. Zhang. The Delta contribution to the paramagnetic polarizability of the proton. *Phys. Rev. D [Rapid Commun.]* **47**, 7-10 (1993).
43. B. R. Holstein and A. M. Nathan. Dispersion relations and the nucleon polarizability. *Phys. Rev. D* **49**, 6101-6108 (1994).
44. L. De Braeckeleer, E. G. Adelberger, J. H. Gundlach, M. Kaplan, D. Markoff, A. M. Nathan, W. Schieff, K. A. Snover, D. W. Storm, K. B. Swartz, D. Wright, and B. A. Brown. Radiative decays of the 16.6 and 16.9 MeV states in ^8Be . *Phys. Rev. C* **51**, 2778-2788 (1995).
45. B. E. MacGibbon, G. Garino, M. A. Lucas, A. M. Nathan, G. Feldman, and B. Dolbilkin. Measurement of the electric and magnetic polarizabilities of the proton. *Phys. Rev. C* **52**, 2097-2109

- (1995).
46. R. Igarashi, J. C. Bergstrom, H. S. Caplan, K. G. E. Doss, E. L. Hallin, D. M. Skopik, D. Delli-Carpini, E. C. Booth, E. K. McIntyre, J. P. Miller, M. A. Lucas, B. E. MacGibbon, A. M. Nathan, and D. Wells. Photon scattering from ^{12}C and ^4He nuclei near the D (1232) resonance. *Phys. Rev. C* **52**, 755-763 (1995).
 47. G. Feldman, K. E. Mellendorf, R. A. Eisenstein, F. J. Federspiel, G. Garino, R. Igarashi, N. R. Kolb, M. A. Lucas, B. E. MacGibbon, W. K. Mize, A. M. Nathan, R. E. Pywell, and D. P. Wells. Compton scattering, meson exchange, and the polarizabilities of bound nucleons. *Phys. Rev. C* **54**, R2124-2128 (1996).
 48. K. Ackerstaff, R. J. Holt, A. M. Nathan, N. C. R. Makins, et al. Measurement of the neutron spin structure function g_n^1 with a polarized ^3He internal target. *Phys. Lett.* **B404**, 383-389 (1997).
 49. A. M. Nathan. Baseball pitches. *Scientific American* **277**, 102-103 (1997).
 50. K. Ackerstaff, R. J. Holt, A. M. Nathan, N. C. R. Makins, et al. The Hermes spectrometer. *Nucl. Instrum. Meth.* **A 417**, 230-265 (1998).
 51. D. Babusci, G. Giordano, A. I. L'vov, G. Matone, and A. M. Nathan. Low-energy Compton scattering of polarized photons on polarized nucleons. *Phys. Rev. C* **58**, 1013-1041 (1998).
 52. J. Tonnison, A. M. Sandorfi, S. Hoblit, and A. M. Nathan. First extraction of a spin polarizability of the proton. *Phys. Rev. Lett.* **80**, 4382-4385 (1998).
 53. D. Abbott, H. Gao, R. J. Holt, M. A. Miller, A. M. Nathan, B. Terburg, et al. Quasifree ($e, e' p$) reactions and proton propagation in nuclei. *Phys. Rev. Lett.* **80**, 5072-5076 (1998).
 54. C. Bochna, B. P. Terburg, D. H. Beck, R. V. Cadman, T. A. Forest, H. Gao, R. J. Holt, M. A. Miller, A. M. Nathan, B. R. Owen, N. Simicevic, S. E. Williamson, et al. Measurements of deuteron photodisintegration up to 4.0 GeV. *Phys. Rev. Lett.* **81**, 4576-4579 (1998).
 55. K. Ackerstaff, B. Bains, R. V. Cadman, H. Gao, R. J. Holt, N. C. R. Makins, M. A. Miller, A. Most, A. M. Nathan, J. M. Niczyporuk, B. R. Owen, S. E. Williamson, et al. Flavor decomposition of the polarized quark distributions in the nucleon from inclusive and semi-inclusive deep-inelastic scattering. *Phys. Lett. B* **464**, 123-134 (1999).
 56. A. I. L'vov and A. M. Nathan. Sum rule for the backward spin polarizability of the nucleon from a backward dispersion relation. *Phys. Rev. C* **59**, 1064-1069 (1999).
 57. D. G. Meekins, D. H. Beck, C. Bochna, R. V. Cadman, T. A. Forest, H. Gao, R. J. Holt, M. A. Miller, A. M. Nathan, B. R. Owen, N. Simicevic, B. P. Terburg, and S. E. Williamson. Coherent π^0 photoproduction on the deuteron up to 4 GeV. *Phys. Rev. C* **60**, 052201 (1999).
 58. K. Ackerstaff, B. Bains, R. V. Cadman, H. Gao, R. J. Holt, N. C. R. Makins, M. A. Miller, A. Most, A. M. Nathan, B. R. Owen, S. E. Williamson, et al. Beam-induced nuclear polarization in a gaseous polarized hydrogen target. *Phys. Rev. Lett.* **82**, 1164-1168 (1999).
 59. K. Ackerstaff, B. Bains, R. V. Cadman, H. Gao, R. J. Holt, N. C. R. Makins, M. A. Miller, A. Most, A. M. Nathan, B. R. Owen, S. E. Williamson, et al. Observation of a coherence length effect in exclusive ρ^0 electroproduction. *Phys. Rev. Lett.* **82**, 3025-3029 (1999).

60. A. M. Nathan. Elastic photon-proton scattering: the polarizabilities of the proton. *Rad. Phys. & Chem.* **56**, 113-123 (1999).
61. Alan M. Nathan. Dynamics of the baseball-bat collision. *Am. J. Phys.* **68**, 979-990 (2000).
62. K. Ackerstaff, B. Bains, H. Gao, R. J. Holt, N. C. R. Makins, M. A. Miller, A. Most, A. M. Nathan, J. M. Niczyporuk, S. E. Williamson, et al. Measurement of angular distributions and $R = \sigma_L/\sigma_T$ in diffractive electroproduction of ρ^0 mesons. *Europhys. J. C* **18(2)**, 303-316 (2000).
63. K. Ackerstaff, B. Bains, M. Bouwhuis, H. Gao, R. J. Holt, N. C. R. Makins, A. Most, A. M. Nathan, J. M. Niczyporuk, B. R. Owen, S. E. Williamson, et al. Nuclear effects on $R = \sigma_L/\sigma_T$ in deep-inelastic scattering. *Phys. Lett. B* **475**, 386-394 (2000).
64. D. Dutta, C. Bochna, E. E. W. Bruins, H. Gao, R. J. Holt, M. A. Miller, A. M. Nathan, B. Terburg, et al. Separated spectral functions for the quasifree $^{12}\text{C}(e, e' p)$ reaction. *Phys. Rev. C* **61**, 061602-1-5 (2000).
65. A. Airapetian, B. Bains, M. Bouwhuis, H. Gao, R. J. Holt, N. C. R. Makins, M. A. Miller, A. Most, A. M. Nathan, B. R. Owen, S. E. Williamson, et al. Evidence for a single-spin azimuthal asymmetry in semi-inclusive pion electroproduction. *Phys. Rev. Lett.* **84**, 4047-4051 (2000).
66. A. Airapetian, B. Bains, R. J. Holt, N. C. R. Makins, M. A. Miller, A. M. Nathan, B. R. Owen, S. E. Williamson, et al. Measurement of the spin asymmetry in the photoproduction of pairs of high- p_T hadrons at HERMES. *Phys. Rev. Lett.* **84**, 2584-2588 (2000).
67. A. Airapetian, M. Bouwhuis, H. Gao, R. J. Holt, N. C. R. Makins, M. A. Miller, A. Most, A. M. Nathan, J. M. Niczyporuk, B. R. Owen, S. E. Williamson et al. Measurement of longitudinal spin transfer to Lambda hyperons in deep inelastic lepton scattering. *Phys. Rev. D* **64**, 112005-1-7 (2001).
68. E. C. Schulte, D. H. Beck, C. W. Bochna, M. Bouwhuis, R. V. Cadman, M. A. Miller, A. M. Nathan, et al. Measurement of the high energy two-body deuteron photodisintegration differential cross section. *Phys. Rev. Lett.* **87**, 102302-1-4 (2001).
69. Alan M. Nathan. Characterizing the performance of baseball bats. *Am. J. Phys.* **71**, 134-143 (2003).
70. L. V. Smith, J. Broker, and A. M. Nathan. A study of softball player swing speed. *Sports Dynamics Discovery and Application*, edited by A. Subic, P. Trivailo, and F. Alam, RMIT University, Melbourne Australia, pp. 12-17. (2003).
71. H. Tanaka, B. Bains, M. Bouwhuis, R. Holt, N.C.R. Makins, Y. Miyachi, A. Most, A. Nathan, H. Ohsuga, B.R. Owen, T.A. Shibata, S. Williamson. A gain monitoring system with a Nd:YAG laser for the photomultipliers of the Hermes experiment. *Nucl. Instrum. Meth.* **A515**, 725-732 (2003).
72. Alan M. Nathan, Daniel A. Russell, and Lloyd V. Smith. The physics of the trampoline effect in baseball and softball bats. *The Engineering of Sport V*, edited by M. Hubbard, R. Mehta, and J. Pallis, UC Davis, Davis CA, pp. 38-44 (2004).
73. The Hall A Collaboration. Basic Instrumentation for Hall A at Jefferson Laboratory. *Nucl.Instrum.Meth.* **A522**, 294-346 (2004).
74. A. Danagoulian, A. M. Nathan, M. Roedelbronn, et al. Polarization transfer in proton Compton

- scattering at high momentum transfer, *Phys. Rev. Lett.* **94**, 242001-242005 (2005).
75. Rod Cross and Alan M. Nathan. Scattering of a baseball by a bat. *Am. J. Phys.* **74**, 896-904 (2006).
76. Alan M. Nathan, J. Hopkins, L. Chong, and H. Kaczmariski. The effect of spin on the flight of a baseball. *The Engineering of Sport VI*, edited by E. F. Moritz and S. Haake, Munich, vol. 1, pp. 23-28 (2006).
77. A. Danagoulian, M. Roedelbronn, A. M. Nathan, et al. Compton-scattering cross section on the proton at high momentum transfer. *Phys. Rev. Lett.* **98**, 152001-1—152001-5 (2007).
78. Rod Cross and Alan M. Nathan. Experimental study of the gear effect in ball collisions. *Am. J. Phys.* (Am. J. Phys. **75**, 658-664 (2007)).
79. Alan M. Nathan. Effect of spin on the flight of a baseball. *Am. J. Phys.* **76**, 199-224 (2008).
80. M. K. McBeath, A. M. Nathan, A. T. Bahill, and D. G. Baldwin. Paradoxical pop-ups: Why are they difficult to catch? *Am. J. Phys.* **76**, 723-729 (2008).
81. Rod Cross and Alan M. Nathan. Performance vs. moment of inertia of sporting instruments. *Sports Technology* **2**, 7-15 (2009).
82. A. M. Nathan and L. V. Smith, 4th Asia-Pacific Congress on Sports Technology, Honolulu, Hawaii, *The Impact of Technology on Sport*, 257-262 (2009).
83. Lloyd V. Smith, Alan M. Nathan, Joseph G. Duris. A determination of the dynamic response of softballs. *Sports Engineering* **12**, 163-169 (2010).
84. Alan M. Nathan, J. J. Crisco, R. M. Greenwald, Daniel A. Russell, and Lloyd V. Smith. A comparative study of baseball bat performance. *Sports Engineering* **79**, 575-580 (2011).
85. Alan M. Nathan, Lloyd V. Smith, Warren L. Faber, and Daniel A. Russell. Corked bats juiced balls, and humidors: The physics of cheating in baseball. *American Journal of Physics* **13**, 153-162 (2011).
86. Alan M. Nathan, Lloyd V. Smith, Warren L. Faber. Reducing the effect of ball properties on bat performance measurements. Accepted for publication, *Sports Technology* (April 2011).
87. S. S. Henshaw, M. A. Ahmed, G. Feldman, A. M. Nathan, and H. R. Weller. A new method for precise determination of the isovector giant quadrupole resonance in nuclei. *Phys. Rev. Lett.* **107**, 222501-1—222501-5 (2011).