

BENJAMIN F. BAYMAN

Professor

Research Interests

The interpretation of the properties of discrete and continuum states of atomic nuclei in terms of the interactions between the constituent particles. '

Birthdate: December 12, 1930

Education and Experience

Education: Ph.D., The University of Edinburgh, 1951-1955
B.,Ch.E., The Cooper Union School of Engineering, 1947-1951 Bronx High School of Science, 1944-1947

Positions: Professor, University of Minnesota, 1968-present

Visiting Professor, Universities of Padua and Milan, on about a dozen occasions since 1991

Visiting Professor, Comision Nacional de Energia Atomica, Buenos Aires, Spring 1980, 1983, Summer 1984, 1986, 1988

Visiting Professor, Nankai University, Tianjin, PRC, Summer 1985

Visiting Professor, Northeast Normal University, Changchun, PRC, Summer 1985

Visiting Professor, Australian National University, Summer 1980

Associate Professor, University of Minnesota, 1964-1968
Summer Visitor at Brookhaven National Laboratory (1965, 1967, 1969, 1971, 1973, 1976, 1978, 1981) and at Lawrence Berkeley Laboratory (1961, 1968)

Assistant Professor, Princeton University, 1961-1964

Ford Foundation Research Fellow, Institute of Theoretical Physics, University of Copenhagen, 1956-1961

Research Fellow, University of Edinburgh, 1955-1956

Professional Activities and Honors

Tau Beta Pi

Fulbright Scholarship

Institute of Technology Distinguished Teacher Award (1968, 1978)

Fellow, American Physical Society

Committees:

Committee on Education, American Physical Society, 1977-1979

Program Advisory Committee, Van de Graaff Laboratory, Brookhaven

National Laboratory, 1978-1984 Associate Editor, Journal of

Mathematical Physics, 1975-1977

Associate Editor, American Journal of Physics, 1980-1983 Department of

Energy, Facilities Review Committee, 1981 Visiting Committee, Physics and

Accelerator Division, Brookhaven National Laboratory, 1979-1982, Chairman

in 1982 Visiting Committee, Lawrence Berkeley Laboratory, 1979-1981

Executive Committee, Nuclear Physics Division, American Physical Society,

1977-1980

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Invited Talks

1979-1980

"Collisions Between Heavy Nuclei", Australian National University.

"Collisions Between Heavy Nuclei", Comision Nacional de Energia Atomica, Buenos Aires.

1980-1981

"The Structure of Matter", Minnesota Academy of Sciences.

1981-1982

"Anomalons as Quasi-Molecular Nuclear States", Princeton University, Iowa State University, Argonne National Laboratory.

1982-1983

"The Role of Spin in Heavy Ion Reactions", Workshop on Heavy-Ion Direct Reactions, Brookhaven National Laboratory.

"Theory of Knots and Hitches", Chemical Engineering Student Society, University of Minnesota.

"Anomalous and Induced Fission in Relativistic Heavy-Ion Reactions", Comision Nacional de Energia Atomica, Buenos Aires.

1983-1984

"Faddeev Approach to Two-Nucleon Transfer Reactions", Comision Nacional de Energia Atomica, Buenos Aires.

1984-1985

"Anomalons as Quasi-Molecular Nuclear States", University of Southern Illinois, Carbondale.

"Collisions of heavy nuclei", Nankai University, Tianjin, China

1991

"What Happened to Cold Fusion ?", Physics Department, University of North Dakota, Fargo.

"Charge Transfer in Collisions between Relativistic Nuclei", Physics Department, Rutgers University, New Brunswick.

1994

"High-energy nuclear transfer reactions", presented at the symposium "The Harmony of Physics", in honor of the 70th birthday of Spartak Belyaev, University of Pennsylvania.

2001

"Relativistic Coulomb Excitation", Lectures given at workshop on Selected Topics in Nuclear and Atomic Physics, Fiera di Primero, Italy.

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Publications

1. "A nuclear emulsion study of the radioactive decay of Actinium X (^{223}Ra)", B. F. Bayman and M. A. S. Ross, Proc. Phys. Soc. A68 (1955) 110.
2. "On the nuclear deformation as a consequence of the 2-particle interaction", B. F. Bayman, Proceedings of the Paris Conference on Nuclear Physics", (1958) 710.
3. "Levels in ^{90}Zr : theoretical", B. F. Bayman, A. S. Reiner and R. K. Sheline, Phys. Rev. 115 (1959) 1627.
4. "On the connection between the cluster model and the SU_3 coupling scheme", B. F. Bayman and A. Bohr, Nucl. Phys. 9, (1959) 596.
5. "On the coupling of a $j=3/2$ particle to nuclear quadrupole surface oscillations", B. F. Bayman and L. Silverberg, Nucl. Phys. 16 (1960) 625.
6. "A derivation of the pairing-correlation method", B. F. Bayman, Nucl. Phys. 15. (1960) 33.
7. "Groups and their application to spectroscopy", B. F. Bayman, Nordita (1960) translated into Russian (1961 and Chinese (1963)).
8. "The (p, α) reaction and seniority in the $f_{7/2}$ shell", B. F. Bayman, F. P. Brady and R. Sherr, Rutherford Jubilee International Conference, Manchester (1961) 553.
9. "Exterior Wavefunctions for the triton ground state", B. F. Bayman, Proceedings of the First Eastern Theoretical Physics Conference, Gordon and Breach (1962) 79.
10. "Beta-decay transition probabilities and magnetic moments in the $f_{7/2}$ shell", B. F. Bayman, J. D. McCullen and L. Zamick, Phys. Rev. Lett. 11 (1963) 215.
11. "Spectroscopy in the $f_{7/2}$ shell", B. F. Bayman, J. D. McCullen and L. Zamick, Phys. Rev. 134 (1964) B515.
12. "Wavefunctions in the $f_{7/2}$ shell", B. F. Bayman, J. D. McCullen and L. Zamick, Princeton University Technical Report NYO-9891.
13. "Recent research on medium-weight nuclei", B. F. Bayman, Comptes Rendus du Congress Internationale de Physique Nucleaire, Paris (1964).
14. "Nuclear structure information from many-particle transfer reactions", B. F. Bayman, Conference on Nuclear Spectroscopy with Direct Reactions, ANL 6878 (1964) 325.
15. "Excitation of $T = T_z+2$ states", B. F. Bayman and G. T. Garvey, Conference on Nuclear Spectroscopy with Direction Reactions, ANL 6878 (1964) 125.
16. "General properties of nuclear models", B. F. Bayman, Proceedings of the Scottish Universities' Summer School on Nuclear Structure and Electromagnetic Interactions, Edinburgh (1964).

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17. "The non-existence of the tetra-neutron", B. F. Bayman and Y. C. Tang, Phys.Rev.Lett 15 (1965) 165.
18. "Excitation of isobaric analog states in medium-weight nuclei by the (p,d) reaction", B. F. Bayman, R. Sherr, E. Rost, M. E. Rickey and C. G. Hoot, Phys. Rev. 139 (1965) B1272
19. "Recent Experimental tests of nuclear models", B. F. Bayman, 1965 Session of the Latin American Summer School, Gordon and Breach, 445.
20. "Table of identical-particle fractional parentage coefficients", B. F. Bayman and A. Lande, Nucl. Phys. 77 (1966) 1
21. "Hole states of ^{43}Ca and ^{47}Ca ", B. F. Bayman, T. W. Conlon and E. Kashy, Phys. Rev. 144 (1966) 941.
22. "Isobaric spin without charge space", B. F. Bayman, Am. Jour. Phys. 34 (1966) 216.
23. "Relative-angular-momentum-zero part of two-nucleon wave functions", B. F. Bayman and A. Kallio, Phys. Rev. 156 (1967) 1121.
24. "Isobaric spin in stripping and pickup reactions", B. F. Bayman, Conference on isobaric spin in nuclear physics, Talahassee, 1966 Academic Press, p. 503.
25. "Isobaric analogue states", B. F. Bayman, Rendicotti della Scuola Internazionale di Fizica "E. Fermi" XL-Corso (1967) 380
26. "Analysis of two-neutron ($L = 0$) transfer cross-section for calcium and nickel", B. F. Bayman and N. M. Hintz, Phys. Rev. 172 (1968) 1113.
27. "Shell model calculation of the even-parity states of ^{43}Ca ", B. F. Bayman and S. Pittel, Phys. Rev. 187 (1969) 1398.
28. "Isospin structure of pairing collective modes", B. F. Bayman, D. R. Bes and R. A. Broglia, Phys. Rev. Lett. 13 (1969) 1299.
29. "A rotating 2-dimensional harmonic oscillator", B. F. Bayman and Darryl Thayer, Am. Jour. Phys. 37 (1969) 841.
30. "Isobaric spin and direct reactions", B. F. Bayman, Proceedings of the Asilomar Conference on Nuclear Isospin, Academic Press (1969) 215.
31. "Finite-range calculation of the two-neutron transfer reaction", B. F. Bayman, Phys. Rev. Lett. 25. (1970) 1768.
32. "Shell-model continuum in nuclear bound states", B. F. Bayman and R. H. Ibarra, Phys. Rev. C1 (1970) 1786.
33. "Finite-range calculations of the two-neutron transfer reaction", B. F. Bayman, Nucl. Phys. A168 (1971) 1.
34. "Sum rules for 2-nucleon transfer reactions", B. F. Bayman and C. F. Clement, Phys. Rev. Lett. 29. (1972) 1020.
35. "Distorted-wave theory for two-nucleon transfer", B. F. Bayman, Symposium on Two-Nucleon Transfer and Pairing Excitations, PHY-1972H, Argonne National Laboratory (1972)169.

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36. "Monte Carlo calculations of two-neutron transfer cross-sections", B. F. Bayman and D. H. Feng, Nucl. Phys. A205 (1973) 513.
37. "Finite-range full-recoil calculation for two-nucleon transfer between heavy ions", B. F. Bayman, Phys. Rev. Lett. 32. (1974) 71.
38. "A model of the behavior of solid objects during collision", B. F. Bayman, Am Jour. Phys. 44 (1976) 671.
39. "Two-neutron stripping reaction ($^{18}\text{O},^{16}\text{O}$) on ^{48}Ca ", B. F. Bayman, J. F. Petersen, D. A. Lewis, D. Dehnhard and H. P. Morsch, Phys. Rev. Lett. 36 (1976) 307.
40. "Spin-dependent effects in heavy-ion reactions I and II", B. F. Bayman, A. Dudek Ellis and P. J. Ellis, Proceedings of the Tokyo International Conference on Nuclear Structure, (1977) 595, 596.
41. "Cluster structure of a six-quark deuteron in the harmonic-oscillator model", B. F. Bayman and A. N. Mitra, Proceedings of the Tokyo International Conference on Nuclear Structure, (1977) 839.
42. "Theory of hitches", B. F. Bayman, Am Jour. Phys. 41 (1977) 185.
43. "Single-neutron transfer to ^{29}Si , $^{41,49}\text{Ca}$ and ^{55}Fe states induced by the ($^{18}\text{O},^{17}\text{O}$) and ($^{18}\text{O},^{17}\text{O}_{.87\text{ MeV}}$) reactions", B. Bayman, J. F. Petersen and D. Dehnhard, Phys. Rev. C15 (1977) 1719.
44. "Spin-dependent effects in heavy-ion reactions", B. F. Bayman, A. Dudek-Ellis and P. J. Ellis, Nucl. Phys. A301 (1978) 141.
45. "A generalization of the spherical harmonic gradient formula", B. F. Bayman, J. Math. Phys. 19, 2558 (1978).
46. "Two-neutron transfer reaction mechanism with heavy ions at sub-coulomb energies", B. F. Bayman, M. A. Franey, H. S. Lilley and W. R. Phillips, Phys. Rev. Lett. 41 (1978) 837.
47. "Spectroscopy with the $^{45}\text{Sc}(\alpha, p)^{48}\text{Ti}$ reaction at 26 Mev", B. F. Bayman, A. Evinay, C. Ellegaard, J. D. Garrett and Ole Hansen, Nucl. Phys. A318 (1979) 317.
48. "A simple solution to a problem arising from the processing of finite accuracy digital data using integer arithmetic", B. F. Bayman and J. H. Broadhurst, Journal of Nuclear Instruments and Methods, 167 (1979) 475.
49. "An introduction to the study of collisions between heavy nuclei", B. F. Bayman, Proceedings of the Third Annual Workshop in Nuclear Physics, Comision Nacional de Energia Atomica, Buenos Aires, 1980.
50. "Lecture notes: Collisions between heavy nuclei", B. F. Bayman, Research School of Physical Sciences, Australian National University Report ANU-P/799, Canberra, 1981.
51. "First- and second-order contributions to two-nucleon transfer reactions", B. F. Bayman and J. Chen, Bull. Am. Phys. Soc. 25, 742 (1980).

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52. "One-step and two-step contributions to two-nucleon transfer reactions", B. F. Bayman and Jongsheng Chen, Phys. Rev. C26 1509 (1982).
53. "Interpretation of anomalous mean-free-paths of projectile fragments from relativistic heavy-ion collisions", B. F. Bayman, P. J. Ellis, and Y. C. Tang, Phys. Rev. Lett. 49, 532 (1982).
54. "Inelastic excitation and spin-flip in heavy-ion reactions", B. F. Bayman, S. Chakravarti, P. J. Ellis and Q. K. K. Liu, Phys. Rev. 27C, 143 (1983).
55. "Study of $^{46,48}\text{Ca}(\alpha, p)$ reactions", B. F. Bayman, C. Ellegaard, J. D. Garrett, Ole Hansen, S. Y. Van der Werf, R. R. Betts and S. B. Dicenzo, Nucl. Phys. A406, 134 (1983).
56. "The proximity potential for heavy-ion reactions on deformed nuclei", B. F. Bayman and A. J. Baltz, Phys. Rev. C26, 1969 (1982).
57. "Quasi-bound state resonances for a particle in two-dimensional well", B. F. Bayman and C. J. Mehoke, Amer. Jour. Phys., 51, 10 (1983).
58. "Response to DiGiacomo's Comment on 'Interpretation of anomalous mean-free-paths of projectile fragments from relativistic heavy-ion collisions'", B. F. Bayman, P. J. Ellis, S. Fricke and Y. C. Tang, Phys. Rev. Lett. 49, 1594 (1982).
59. "Response to Karant's and MacGregor's Comment on 'Interpretation of Anomalous mean-free-paths of projectile fragments from relativistic heavy-ion collisions'", B. F. Bayman, P. J. Ellis and Y. C. Tang, Phys. Rev. Lett. 50, 216 (1983).
60. "The role of spin in heavy-ion reactions", B. F. Bayman, Invited talk at Workshop on Heavy-Ion Direct Reactions, Brookhaven National Laboratory, June, 1983.
61. "Anomalon production and asymmetric fission in relativistic collisions", B. F. Bayman, P. J. Ellis and Y. C. Tang, International Conference on Nuclear Physics, Florence Italy, August 1983.
62. "Towards a spin-dependent potential in heavy-ion inelastic scattering", B. F. Bayman, Q. K. K. Liu, S. Chakravarti and P. J. Ellis, Conference on Heavy Ion Reactions, Catania, Italy (1983).
63. "Anomalon production by impulsive excitation in relativistic heavy ion collisions", B. F. Bayman, P. J. Ellis, S. Fricke and Y. C. Tang, Phys. Rev. Lett. 53, 1322 (1984).
64. "Comment on 'Fission of Uranium Nuclei in Flight at Relativistic Energies'", B. F. Bayman, P. J. Ellis, S. Fricke and Y. C. Tang, Phys. Rev. Lett. 53, 2516 (1984).
65. "Interaction of relativistic helium projectile fragments in nuclear emulsion", B. F. Bayman, S. Fricke and Y. C. Tang, Phys. Rev. C31, 679 (1985).
66. "Electromagnetic Decay of the Giant Quadrupole Resonances I: Reaction Mechanism and Angular Distributions of the Emitted Photons", B.F. Bayman, D.R. Bes, P. Curutchet, O. Dragun, N.N. Scoccola and J.E. Testoni, Nucl. Phys. A452 (1986) 513.
67. "A Review of Undergraduate Physics", B.F. Bayman and M. Hamermesh, John Wiley and Sons, Inc., New York, 1986.
68. "Form Factors for a Proximity Interaction between Deformed Nuclei", B.F. Bayman, Phys. Rev. C34, 1346 (1986).

69. "Anomalons in Relativistic Heavy-Ion Collisions" B. F. Bayman and Y. C. Tang, Phys. Rep. 147, 157 (1987).
70. " α -like part of four-nucleon wave functions", B. F. Bayman, S. M. Lenzi and E. E. Maqueda, Phys. Rev. C41. 109 (1990).
71. "Two-nucleon-transfer form factors in heavy rotational nuclei", B. F. Bayman, M. Bernath, D. R. Bes, Phys. Rev. C41. 581 (1990).
72. "Superconducting phase transition in a two-dimensional Chern-Simons theory", J. Kapusta, M.E. Carrington, B.F. Bayman, D. Siebert and C.S. Song, Phys. Rev. B44, 7519 (1991).
73. "One-nucleon transfer between heavy ions at intermediate energies" , B.F. Bayman, S.M. Lenzi, A. Vitturi and F. Zardi, Phys. Rev. C50, 2096 (1994)
74. "Temperature dependence of the penetration depth of $\text{YBa}_2\text{Cu}_3\text{O}_{7-8}$ films near T_c ", Z.-H. Lin, C.G. Spalding, B.F. Bayman, A.M. Goldman and O.T. Valls, Europhys. Lett., 32, 573 (1995)
75. "A Glauber-model approach to one-nucleon transfer reactions", Physics Reports, 264, 39 (1996)
76. "Integration equation approach to relativistic Coulomb excitation", B.F. Bayman and F. Zardi, Phys. Rev. C59, 2189 (1999).
77. "Equivalence of the long-wavelength approximation and the truncated-Taylor expansion in relativistic Coulomb excitation" B.F. Bayman and F. Zardi, Phys. Rev. C67 017901 (2003).
78. "Gauge dependence of calculations in relativistic Coulomb excitation", B.F. Bayman and F. Zardi, Phys. Rev. C68, 014905 (2003).
79. "Comparison of exact and approximate cross-sections in relativistic Coulomb excitation", B. F. Bayman and F. Zardi, Phys. Rev. C68 014908 (2003).
80. "Quantum derivation of the use of classical electromagnetic potentials in relative Coulomb excitations", B.F. Bayman and F. Zardi, Phys. Rev. C71, 014904 (2005).
81. ^{120}Sn homologous levels via the $^{123}\text{Sb}(p,\alpha)^{120}\text{Sn}$ reaction: Experimental evidence and microscopic calculations", P. Guazzoni, L.Zetta, B.F. Bayman, A. Covello, A. Gargano, G. Graw, R. Hertenberger, H.-F. Wirth and M. Jaskola, Phys. Rev., C72 044604 (2005)
82. "Degeneracies when only T=1 two-body interactions are present", A. Escuderos, B.F. Bayman, L. Zamick and S.J.O. Robinson, Phys. Rev. C72 054301 (2005)
83. "Dissociation of a heavy quarkonium quark-gluon plasma", Sidi C. Benzahara and B.F. Bayman, Elsevier High Energy Density Physics, 1 52 (2005)
84. "Relativistic Coulomb excitation around grazing impact parameters", B.F. Bayman and F. Zardi, Phys. Rev. C74, 024905 (2006).

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85. "Spectroscopy of ^{110}Sn via the high-resolution $^{112}\text{Sn}(p,t)^{110}\text{Sn}$ reaction", P. Guazzoni, L.Zetta, A. Covello, A. Gargano, B.F. Bayman, G. Graw, R. Hertenberger, H.-F. Wirth and M. Jaskola, Phys. Rev, C74 054605 (2006)