

## PUBLICATIONS : NICHOLAS STEPHEN MANTON

### Research Papers

1. The Force between 't Hooft-Polyakov Monopoles, *Nuclear Physics* **B126** (1977) 525-541.
2. Complex Structure of Monopoles, *Nuclear Physics* **B135** (1978) 319-332.
3. Instantons on a Line, *Physics Letters* **76B** (1978) 111-112.
4. An Effective Lagrangian for Solitons, *Nuclear Physics* **B150** (1979) 397-412.
5. Space-Time Symmetries in Gauge Theories (with P. Forgács), *Communications in Mathematical Physics* **72** (1980) 15-35.
6. A New Six-Dimensional Approach to the Weinberg-Salam Model, *Nuclear Physics* **B158** (1979) 141-153.
7. Symmetries and Conservation Laws in Gauge Theories (with R. Jackiw), *Annals of Physics* **127** (1980) 257-273.
8. An Alternative Action for Lattice Gauge Theories, *Physics Letters* **96B** (1980) 328-330.
9. Monopoles and their Symmetries, *Annals of Physics* **132** (1981) 108-120.
10. The Geometrical Significance of Certain Higgs Potentials: An Approach to Grand Unification (with G. Chapline), *Nuclear Physics* **B184** (1981) 391-405.
11. Fermions and Parity Violation in Dimensional Reduction Schemes, *Nuclear Physics* **B193** (1981) 502-516.
12. Monopole Pair Production in a Magnetic Field (with I.K. Affleck), *Nuclear Physics* **B194** (1982) 38-64.
13. Pair Production at Strong Coupling in Weak External Fields (with I.K. Affleck and O. Alvarez), *Nuclear Physics* **B197** (1982) 509-519.
14. A Remark on the Scattering of BPS Monopoles, *Physics Letters*, **110B** (1982) 54-56;  
reprinted in:  
**Magnetic Monopoles**, eds. A.S. Goldhaber and W.P. Trower, American Association of Physics Teachers, 1990.
15. Multi-Monopole Dynamics, in **Monopoles in Quantum Field Theory**, eds. N. Craigie, P. Goddard and W. Nahm, World Scientific, Singapore, 1982.
16. Universal Scaling Behaviour for Iterated Maps in the Complex Plane (with M. Nauenberg), *Communications in Mathematical Physics* **89** (1983) 555-570.
17. Unification of Yang-Mills Theory and Supergravity in Ten Dimensions (with G. Chapline), *Physics Letters* **120B** (1983) 105-109;  
reprinted in:  
**Modern Kaluza-Klein Theories**, eds. T. Appelquist, A. Chodos and P.G.O. Freund, Addison-Wesley, 1987;

**Supersymmetry, Vol. 2**, ed. S. Ferrara, North-Holland/World Scientific, 1987;  
**Supergravities in Diverse Dimensions, Vol. 1**, eds. A. Salam and E. Sezgin, North-Holland/World Scientific, 1989.

18. Topology in the Weinberg-Salam Theory, *Physical Review* **D28** (1983) 2019-2026.
19. The Schwinger Model and its Axial Anomaly, *Annals of Physics* **159** (1985) 220-251.
20. A Saddle-point Solution in the Weinberg-Salam Theory (with F. Klinkhamer), *Physical Review* **D30** (1984) 2212-2220.
21. Ditto, in **Proceedings of the Workshop on Electroweak Symmetry Breaking**, Lawrence Berkeley Laboratory, 1984 (LBL 18571).
22. Dimensional Reduction of Supergravity, *Annals of Physics* **167** (1986) 328-353.
23. Monopole Interactions at Long Range, *Physics Letters* **154B** (1985) 397-400 (Errata: *Physics Letters* **157B** (1985) 475).
24. Classical and Quantum Dynamics of BPS Monopoles (with G.W. Gibbons), *Nuclear Physics* **B274** (1986) 183-224.
25. Skyrmions in Flat Space and Curved Space (with P.J. Ruback), *Physics Letters* **181B** (1986) 137-140.
26. Dynamics of Monopoles, in **Topological and Geometrical Methods in Field Theory**, eds. J. Hietarinta and J. Westerholm, World Scientific, Singapore, 1986.
27. Surprises in Monopole Dynamics, in **Non-Perturbative Methods in Quantum Field Theory**, eds. Z. Horváth, L. Palla and A. Patkós, World Scientific, Singapore, 1987.
28. Geometry of Skyrmions, *Communications in Mathematical Physics* **111** (1987) 469-478.
29. Connections on Discrete Fibre Bundles, *Communications in Mathematical Physics* **113** (1987) 341-351.
30. Is the  $B = 2$  Skyrmion Axially Symmetric? *Physics Letters* **192B** (1987) 177-179.
31. Monopole and Skyrmion Bound States, *Physics Letters* **198B** (1987) 226-230.
32. Maximal Symmetry of the Skyrme Crystal (with A.S. Goldhaber), *Physics Letters* **198B** (1987) 231-234.
33. Sphalerons on a Circle (with T.M. Samols), *Physics Letters* **207B** (1988) 179-184.
34. Unstable Manifolds and Soliton Dynamics, *Physical Review Letters* **60** (1988) 1916-1919.
35. Skyrmion-Skyrmion Interactions, in **Quarks '88**, eds. A.N. Tavkhelidze et al., World Scientific, Singapore, 1989.
36. Radiation from Monopole Scattering (with T.M. Samols), *Physics Letters* **215B** (1988) 559-563.
37. New Skyrmion Solutions on a 3-Sphere (with A.D. Jackson and A. Wirzba), *Nuclear Physics* **A495** (1989) 499-522.

38. Skyrmions from Instantons (with M.F. Atiyah), *Physics Letters* **222B** (1989) 438-442; reprinted in:  
**Michael Atiyah: Collected Works, Vol. 6**, Clarendon Press, Oxford, 2004.
39. Skyrme Fields and Instantons, in **Geometry of Low-Dimensional Manifolds: 1**, LMS Lecture Note Series 150, eds. S.K. Donaldson and C.B. Thomas, Cambridge University Press, 1990.
40. Skyrmions on  $S^3$  and  $H^3$  from Instantons (with T.M. Samols), *Journal of Physics* **A23** (1990) 3749-3759.
41. Vortices and Anyons, *Physical Review Letters* **67** (1991) 1462-1463.
42. Geometry and Kinematics of Two Skyrmions (with M.F. Atiyah), *Communications in Mathematical Physics* **153** (1993) 391-422; reprinted in:  
**Michael Atiyah: Collected Works, Vol. 6**, Clarendon Press, Oxford, 2004.
43. Statistical Mechanics of Vortices, *Nuclear Physics* **B400[FS]** (1993) 624-632.
44. Bundles over Moduli Spaces and the Quantisation of BPS Monopoles (with B.J. Schroers), *Annals of Physics* **225** (1993) 290-338.
45. Stable Instanton-Generated Skyrme Fields with Baryon Numbers Three and Four (with R.A. Leese), *Nuclear Physics* **A572** (1994) 575-599.
46. Thermodynamics of Vortices in the Plane (with P.A. Shah), *Journal of Mathematical Physics* **35** (1994) 1171-1184.
47. Symmetric Monopoles (with M.K. Murray), *DAMTP report* 94-57.
48. Symmetric Monopole Scattering, in **Proceedings of the XXVII International Conference on High Energy Physics (Glasgow 1994)**, Vol. II, eds. P.J. Bussey and I.G. Knowles, Institute of Physics, Bristol, 1995.
49. Skyrmions and their Pion Multipole Moments, *Acta Physica Polonica* **B25** (1994) 1757-1764.
50. Skyrme Crystal from a Twisted Instanton on a Four-Torus (with P.M. Sutcliffe), *Physics Letters* **342B** (1995) 196-200.
51. Geometry of Defect Scattering, in **Formation and Interactions of Topological Defects**, NATO ASI Series B: Physics Vol. 349, eds. A.-C. Davis and R. Brandenberger, Plenum, New York, 1995.
52. Attractive Channel Skyrmions and the Deuteron (with R.A. Leese and B.J. Schroers), *Nuclear Physics* **B442** (1995) 228-267.
53. Symmetric Monopoles (with N.J. Hitchin and M.K. Murray), *Nonlinearity* **8** (1995) 661-692.
54. The Moduli Space Metric for Well-Separated BPS Monopoles (with G.W. Gibbons), *Physics Letters* **B356** (1995) 32-38.
55.  $\phi^4$  Kinks – Gradient Flow and Dynamics (with H. Merabet), *Nonlinearity* **10** (1997) 3-18.

56. Gradient Flow for Well-Separated Skyrmions (with P.W. Irwin), *Physics Letters* **B385** (1996) 187-192.
57. First Order Vortex Dynamics, *Annals of Physics* **256** (1997) 114-131.
58. Rational Maps, Monopoles and Skyrmions (with C.J. Houghton and P.M. Sutcliffe), *Nuclear Physics B* **510** (1998) 507-537.
59. Volume of Vortex Moduli Spaces (with S.M. Nasir), *Communications in Mathematical Physics* **199** (1999) 591-604.
60. Solitons and their Moduli Spaces, in **Solitons: Properties, Dynamics, Interactions, Applications**, eds. R. MacKenzie, M.B. Paranjape and W.J. Zakrzewski, CRM Series in Mathematical Physics, Springer-Verlag, New York, 2000.
61. Solitons, in **Duality and Supersymmetric Theories**, eds. D.I. Olive and P.C. West, Publications of the Newton Institute, Cambridge University Press, 1999.
62. Deconstructing Supersymmetry, *Journal of Mathematical Physics* **40** (1999) 736-750.
63. Conservation Laws in a First-Order Dynamical System of Vortices (with S.M. Nasir), *Nonlinearity* **12** (1999) 851-865.
64. On the Constraints defining BPS Monopoles (with C.J. Houghton and N.M. Romão), *Communications in Mathematical Physics* **212** (2000) 219-243.
65. Calogero-Moser Models V: Supersymmetry and Quantum Lax Pair (with A.J. Bordner and R. Sasaki), *Progress of Theoretical Physics* **103** (2000) 463-487.
66. Classical Supersymmetric Mechanics (with R. Heumann), *Annals of Physics* **284** (2000) 52-88.
67. Understanding Skyrmions using Rational Maps (with B.M.A.G. Piette), in **European Congress of Mathematics (Barcelona, 2000)**, Vol. I, Prog. Math. **201** (2001) 469-479.
68. Asymptotic Interactions of Critically Coupled Vortices (with J.M. Speight), *Communications in Mathematical Physics* **236** (2003) 535-555.
69. The Dynamics of Vortices on  $S^2$  near the Bradlow Limit (with J.M. Baptista), *Journal of Mathematical Physics* **44** (2003) 3495-3508.
70. The Interaction Energy of Well-Separated Skyrme Solitons (with B.J. Schroers and M.A. Singer), *Communications in Mathematical Physics* **245** (2004) 123-147.
71. Delocalised Spinors (with A.F. Schunck), *Journal of Physics* **A37** (2004) 1415-1436.
72. The Kähler Potential of Abelian Higgs Vortices (with H.-Y. Chen), *Journal of Mathematical Physics* **46** (2005) 052305.
73. The Energy of Scattering Solitons in the Ward Model (with T. Ioannidou), *Proceedings of the Royal Society A* **461** (2005) 1965-1973; in condensed form in *Czechoslovak Journal of Physics* **55** (2005) 1427-1431.
74. Reduced Dynamics of Ward Solitons (with M. Dunajski), *Nonlinearity* **18** (2005) 1677-1689.
75. Superevolution, *Journal of Physics* **A38** (2005) 6065-6079.

76. Angularly Localized Skyrmions (with O.V. Manko), *Journal of Physics* **A39** (2006) 1507-1520.
77. Skyrmions and the  $\alpha$ -Particle Model of Nuclei (with R.A. Battye and P.M. Sutcliffe), *Proceedings of the Royal Society A* **463** (2007) 261-279.
78. Reparametrising the Skyrme Model using the Lithium-6 Nucleus (with S.W. Wood), *Physical Review* **D74** (2006) 125017.
79. On the Spin of the  $B = 7$  Skyrmion (with O.V. Manko), *Journal of Physics* **A40** (2007) 3683-3696.
80. Skyrmions and Nuclei, in **The Many Facets of Geometry: A tribute to Nigel Hitchin**, eds. O. García-Prada, J.P. Bourguignon and S. Salamon, Oxford University Press, 2010.
81. Light Nuclei as Quantized Skyrmions (with O.V. Manko and S.W. Wood), *Physical Review* **C76** (2007) 055203.
82. One-Vortex Moduli Space and Ricci Flow, *Journal of Geometry and Physics* **58** (2008) 1772-1783.
83. Solitons as Elementary Particles: A Paradigm Scrutinized, *Nonlinearity* **21** (2008) T221-T232.
84. Scaling Identities for Solitons beyond Derrick's Theorem, *Journal of Mathematical Physics* **50** (2009) 032901.
85. Light Nuclei as Quantized Skyrmions: Energy Spectra and Form Factors (with S.W. Wood), in Proceedings of the 15th Annual Seminar Quarks 2008, Sergiev Posad, Russia, published online at <http://quarks.inr.ac.ru/2008/proceedings/>.
86. Skyrmions and Nuclei (with R.A. Battye and P.M. Sutcliffe), in **The Multifaceted Skyrmion**, eds. G.E. Brown and M. Rho, World Scientific, Singapore, 2010;  
reprinted in:  
**The Multifaceted Skyrmion (2nd ed.)**, eds. M. Rho and I. Zahed, World Scientific, Singapore, 2017.
87. Light Nuclei of Even Mass Number in the Skyrme Model (with R.A. Battye, P.M. Sutcliffe and S.W. Wood), *Physical Review* **C80** (2009) 034323.
88. Nuclear Spectra from Skyrmions, in **Nuclear Structure and Dynamics '09**, eds. M. Milin et al., AIP Conference Proceedings 1165, American Institute of Physics, 2009.
89. Vortices on Hyperbolic Surfaces (with N.A. Rink), *Journal of Physics* **A43** (2010) 434024 (also in IOP Select).
90. Maximally Non-Abelian Vortices from Self-dual Yang-Mills Fields (with N. Sakai), *Physics Letters* **B687** (2010) 395-399.
91. Vortices and Jacobian Varieties (with N.M. Romão), *Journal of Geometry and Physics* **61** (2011) 1135-1155.
92. Geometry and Energy of Non-abelian Vortices (with N.A. Rink), *Journal of Mathematical Physics* **52** (2011) 043511.

93. Skyrmions, Rational Maps and Scaling Identities (with E.G. Charalampidis and T.A. Ioannidou), *Journal of Mathematical Physics* **52** (2011) 033509.
94. Classical Skyrmions – Static Solutions and Dynamics, *Mathematical Methods in the Applied Sciences* **35** (2012) 1188-1204.
95. Skyrmions – Construction and Applications, in **International Conference on Numerical Analysis and Applied Mathematics 2011**, ed. T.E. Simos, AIP Conference Proceedings 1389, American Institute of Physics, 2011.
96. Geometric Models of Matter (with M.F. Atiyah and B.J. Schroers), *Proceedings of the Royal Society A* **468** (2012) 1252-1279;  
reprinted in:  
**Michael Atiyah: Collected Works, Vol. 7**, Oxford University Press, Oxford, 2014.
97. Monopole Planets and Galaxies, *Physical Review D* **85** (2012) 045022.
98. Platonic Hyperbolic Monopoles (with P.M. Sutcliffe), *Communications in Mathematical Physics* **325** (2014) 821-845.
99. Skyrmions up to Baryon Number 108 (with D.T.J. Feist and P.H.C. Lau), *Physical Review D* **87** (2013) 085034.
100. Vortex Solutions of the Popov Equations, *Journal of Physics A* **46** (2013) 145402.
101. Gravitational Instantons as Models for Charged Particle Systems (with G. Franchetti), *Journal of High Energy Physics* 03 (2013) 072.
102. Vortex Motion on Surfaces of Small Curvature (with D. Dorigoni and M. Dunajski), *Annals of Physics* **339** (2013) 570-587.
103. Newtonian Atlas for Dust-Filled FRW Universe, arXiv:1312.6040 (2013).
104. Quantization of  $T_d$ - and  $O_h$ -symmetric Skyrmions (with P.H.C. Lau), *Physical Review D* **89** (2014) 125012.
105. Rational Relativistic Collisions, arXiv:1406.3014 (2014).
106. States of Carbon-12 in the Skyrme Model (with P.H.C. Lau), *Physical Review Letters* **113** (2014) 232503;  
reprinted in:  
**The Multifaceted Skyrmion (2nd ed.)**, eds. M. Rho and I. Zahed, World Scientific, Singapore, 2017.
107. A Skyrme Model Approach to the Spin-Orbit Force (with C.J. Halcrow), *Journal of High Energy Physics* 01 (2015) 016.
108. Analytic Vortex Solutions on Compact Hyperbolic Surfaces (with R. Maldonado), *Journal of Physics A* **48** (2015) 245403.
109. Scattering of Nucleons in the Classical Skyrme Model (with D. Foster), *Nuclear Physics* **B899** (2015) 513-526.
110. Electron Scattering Intensities and Patterson Functions of Skyrmions (with M. Karliner and C. King), *Journal of Physics G* **43** (2016) 055104.

111. Electromagnetic Transition Strengths for Light Nuclei in the Skyrme model (with M. Haberichter and P.H.C. Lau), *Physical Review* **C93** (2016) 034304.
112. A Dynamical  $\alpha$ -Cluster Model of  $^{16}\text{O}$  (with C.J. Halcrow and C. King), *Physical Review* **C95** (2017) 031303(R).
113. Complex Geometry of Nuclei and Atoms (with M.F. Atiyah), in **Topology and Physics**, eds. C.N. Yang, M.L. Ge and Y.H. He, World Scientific, 2018;  
reprinted with updated references in:  
*International Journal of Modern Physics* **A33** (2018) 1830022.
114. Five Vortex Equations, *Journal of Physics* **A50** (2017) 125403 (showcased in Highlights of 2017).
115. Exact Gravitational Wave Signatures from Colliding Extreme Black Holes (with J. Camps and S. Hadar), *Physical Review* **D96** (2017) 061501(R).
116. Lightly Bound Skyrmions, Tetrahedra and Magic Numbers, arXiv:1707.04073 (2017); revised version: Skyrmions, Tetrahedra and Magic Numbers, *Quarterly Journal of Mathematics* **72** (2021) 735.
117. Quantized Skyrmions from SU(4) Weight Diagrams (with C.J. Halcrow and J.I. Rawlinson), *Physical Review* **C97** (2018) 034307.
118. Rolling Skyrmions and the Nuclear Spin-Orbit Force (with D. Harland), *Nuclear Physics* **B935** (2018) 210-241.
119. Force between Kinks with Long-Range Tails, arXiv:1810.00788 (2018).
120. Forces between Kinks and Antikinks with Long-Range Tails, *Journal of Physics* **A52** (2019) 065401.
121. Oxygen-16 Spectrum from Tetrahedral Vibrations and their Rotational Excitations (with C.J. Halcrow and C. King), *International Journal of Modern Physics* **E28** (2019) 1950026.
122. The Inevitability of Sphalerons in Field Theory, *Philosophical Transactions of the Royal Society A* **377** (2019) 20180327.
122. Iterated  $\phi^4$  Kinks (with K. Oleś and A. Wereszczynski), *Journal of High Energy Physics* 10 (2019) 086.
123. Tetrahedral Intrinsic Structure of Oxygen-16 Revisited (with C.J. Halcrow), in **Proceedings of the International Nuclear Physics Conference, Glasgow 2019** *Journal of Physics: Conference Series* (to appear).
124. Evidence for Tetrahedral Structure of Calcium-40, *International Journal of Modern Physics* **E29** (2020) 2050018.
125. Kink-Antikink Interaction Forces and Bound States in a Biharmonic  $\phi^4$  Model (with R.J. Decker, A. Demirkaya and P.G. Kevrekidis), *Journal of Physics* **A53** (2020) 375702.
126. Nonlinearity, Geometry and Field Theory Solitons, in **Emerging Frontiers in Non-linear Science**, eds. P.G. Kevrekidis et al., Nonlinear Systems and Complexity, Vol. 32, Springer Nature, 2020.

127. Kink Moduli Spaces – Collective Coordinates Reconsidered (with K. Oleś, T. Romańczukiewicz and A. Wereszczynski), *Physical Review D* **103** (2021) 025024.
128. Collective Coordinate Model of Kink-Antikink Collisions in  $\phi^4$  Theory, (with K. Oleś, T. Romańczukiewicz and A. Wereszczynski), *Physical Review Letters* **127** (2021) 071601.
129. Relativistic Moduli Space for Kink Collisions (with C. Adam, K. Oles, T. Roman- czukiewicz and A. Wereszczynski), *Physical Review D* **105** (2022) 065012.
130. Quantum Statistical Mechanics of Vortices, *Journal of Physics A* **55** (2022) 325001.
131. Quantum Statistical Mechanics of Dissolving Abelian Higgs Vortices (with Shiyi Wang), (arXiv:2212.06016, title leaves out Abelian Higgs), *Journal of Physics A* **56** (2023) 205002.
132. The Simplest Oscillon and its Sphaleron (with T. Romańczukiewicz), *Physical Review D* **107** (2023) 085012.
133. Wormhole Model for Neon-20 (with M. Dunajski), *Nuclear Physics A* **1037** (2023) 122702.
134. Neumann Boundary Condition for Abelian Vortices (with Boan Zhao), *Journal of High Energy Physics* 09 (2023) 181.
135. Integration Theory for Kinks and Sphalerons in One Dimension, *Journal of Physics A* **57** (2024) 025202.
136. Spectral Flow of Vortex Shape Modes over the BPS 2-Vortex Moduli Space (with A. Alonso-Izquierdo, W. Garcia Fuertes and J. Mateos Guilarte), *Journal of High Energy Physics* 01 (2024) 020.
137. Robustness of the Hedgehog Skyrmion, *Journal of High Energy Physics* 08 (2024) 015.
138. Collective Coordinate Models for 2-Vortex Shape Mode Dynamics (with A. Alonso Izquierdo, J. Mateos Guilarte and A. Wereszczynski), *Physical Review D* **110** (2024) 085006.
139. Antikink-Kink Forces Reconsidered, arXiv:2410.15412 (2024).
140. A  $CP^2$  SMEFT, arXiv:2411.09521 (2024).

## Books

**Topological Solitons** (with P. Sutcliffe), Cambridge Monographs on Mathematical Physics, Cambridge University Press, 2004; paperback edition (with minor corrections), 2007.

**The Physical World: An Inspirational Tour of Fundamental Physics** (with N. Mee), Oxford University Press, 2017; reprinted twice, with corrections, 2017.

**Skyrmions – A Theory of Nuclei**, World Scientific, 2022.

## Other Publications

1. The Continuing Importance of the Work of P.A.M. Dirac, in **The Eagle 2002**, St. John's College, Cambridge, 2002.
2. Special Issue on Integrability, Topological Solitons and Beyond (coedited with A.S. Fokas), *Journal of Mathematical Physics* **44** (8) (2003) 3147-3673.
3. LMS Annual General Meeting 19/11/04, *London Mathematical Society Newsletter* **333** (2005) 23-24.
4. The Magnetism of St. John's, in *St. John's College: Excellence and Diversity* Third Millennium, 2007.
5. Topological Solitons (notes by Markus Schwarz), Lecture Notes for the XIII Saalburg Summer School 2007.  
<http://www.itp.uni-hannover.de/lechtenf/Events/lectures.html>
6. The Principle of Least Action in Dynamics (2013).  
[www.damtp.cam.ac.uk/user/nsm10/PrincLeaAc.pdf](http://www.damtp.cam.ac.uk/user/nsm10/PrincLeaAc.pdf)
7. Mathematical Physics – What Is It and Why Do We Need It? (contribution to section on Skyrmions), Institute of Physics Report (2014).
8. David Ian Olive, in Oxford Dictionary of National Biography, Oxford University Press, <http://www.oxforddnb.com/view/article/105903> (2016).
9. A Life in Mathematical Science, Part I: Growing-Up, Student and Postdoc Years (2018).  
<http://www.damtp.cam.ac.uk/user/nsm10/NSMbioV2.pdf>