

CURRICULUM VITAE
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RICHARD G. PALMER

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Personal

Born January 28, 1949 in Reigate, England.
British National, U.S. immigrant (permanent resident).

Education

B.A., Theoretical Physics (1st Class), Cambridge, 1970.
Ph.D., Condensed Matter Theory, Cambridge, 1973.
(Adviser: P.W. Anderson)

Appointments

1973-1975 Instructor, Princeton University
1975-1977 Lecturer, Princeton University
1977-1983 Assistant Professor of Physics, Duke University
1983-1991 Associate Professor of Physics, Duke University
1989-2003 External Faculty, Santa Fe Institute
1991- Professor of Physics, Duke University
1992-1995 Professor of Psychology:Experimental, Duke University
1999-2002 Professor of Psychology and Brain Sciences, Duke University
1993-1999 Professor of Computer Science, Duke University

Awards

Lord Kelvin Research Fellowship, 1971-1973
Alfred P. Sloan Fellowship, 1979-1981
Duke Endowment Award for Excellence in Teaching, 1980-1981
Guggenheim Fellowship, 1986-87

General Research Areas

Condensed Matter Theory Statistical Physics
Complex Systems Adaptive Systems

Research Accomplishments (Published contributions in the following areas)

| | |
|-----------------------------|-------------------------------|
| Nuclear Matter Theory | Stat. Mech. of Random Systems |
| Neutron Star Structure | The Replica Method |
| The Pion-Nucleon System | Broken Ergodicity |
| Quantum Crystal Theory | Kinetics of Aggregation |
| Classical Liquid Theory | Neural Networks |
| One-Component Plasmas | Glassy Dynamics |
| ^3He Superfluidity | The Glass Transition |
| Topological Defect Theory | Percolation Theory |
| Spin Glasses | Solid Hydrogen |
| Frustration Models | Dynamics of Complex Systems |
| Combinatorial Optimization | Complex Systems in Economics |
| Renormalization Group | Dynamics of Adaptive Agents |
| Genetic Algorithms | Fitness landscapes |
| Graph-theoretic Algorithms | Monte-Carlo Methods |
| Extinction Models | |

Current Research Interests

Neural Network Theory
Graph-theoretic Algorithms for Spin Glass Problems
Dynamics of Glasses and the Glass Transition
Simulations for Granular Matter

Refereeing

Journals:

American Scientist, Behavioral Processes, Chaos, Chemical Physics,
Complex Systems, Complexity, Information Sciences, Europhysics Letters,
History of Political Economy, Journal of Chemical Physics,
Journal of Economic Behavior & Organization,
Journal of Mathematical Physics, Journal of Physics A, C, D, F,
Journal de Physique (Paris), Journal of Theoretical Biology, Nature,
Physics Letters A, Physica D, Physica Scripta, Physical Review A, B, E,
Physical Review Letters, Revista Mexicana de Fisica, Science

Publishers:

Addison-Wesley, Springer, Prentice-Hall

Grants:

NSF, DOE, AFOSR, ONR, ARO, NRC (Canada)

Foundations:

Several private and state foundations

Teaching Experience

1. Courses Taught

(D = Duke, P = Princeton, S = Santa Fe *Complex Systems Summer School*)

| | |
|--|-------------------------------------|
| Astronomy | D: Physics 55 |
| Astrophysics | D: Physics 305 |
| Behavioral and Neural Modelling | D: Neurosciences 222 |
| Econophysics I (minicourse) | D: Physics 771.03 |
| Econophysics II (minicourse) | D: Physics ??? |
| Einstein and the World As He Saw It | D: Liberal Studies 270 ₂ |
| Electromagnetism | D: Physics 318 |
| The Emergence of Complexity | D: Physics 048 |
| General physics | P: Physics 101–4; D: Physics 52 |
| General physics for majors | D: Physics 41, 42 |
| Math Methods for Physical Sciences I, II | D: Physics 230', 231' |
| Math Methods in Physics | D: Physics 230/301/760 |
| Math Methods in Electromagnetism | D: Physics 231 |
| The Nature of Science | D: Liberal Studies 270 ₁ |
| Networks (minicourse) | D: Physics 391.03 |
| Neural Networks | D: Physics 399; S: CSSS–NN |
| Advanced Nonlinear & Complex Systems | D: Physics 313 |
| Physics for non-scientists | D: Physics 32 |
| Physics Research Seminar | D: Physics 351 |
| Probability and Stochastic Processes | S: CSSS–PSP |
| Self-Organized Criticality (SOC) | D: Physics 201 |
| Seminar Techniques | D: Physics 352 |
| Solid State I | P: Physics 525, 536; D: Physics 309 |
| Solid State II | D: Physics 310 |
| Statistical Mechanics | D: Physics 303; S: CSSS–SM |
| Advanced Statistical Mechanics | D: Physics 304 |

2. Teaching Record (Duke)

| | Fall | Spring | Summer |
|---------|-----------------|-----------------------------------|------------|
| 1977–78 | Physics 309 | Physics 303 | |
| 1978–79 | Physics 32 | Physics 303, 309 | Physics 32 |
| 1979–80 | Physics 32 | Physics 303, 309 | |
| 1980–81 | Physics 32, 310 | (leave) | |
| 1981–82 | Physics 52 | Physics 309 | |
| 1982–83 | Physics 41 | Physics 42 | |
| 1983–84 | (leave) | Physics 304($\frac{1}{2}$), 309 | |
| 1984–85 | Physics 32 | Physics 309 | |
| 1985–86 | Physics 52 | Physics 309, LS 270 ₁ | |
| 1986–87 | (sabbatical) | (sabbatical) | |

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|---------|---------------------------------------|--|------------|
| 1987–88 | Physics 41 | Physics 309, 304($\frac{1}{4}$) | |
| 1988–89 | Physics 32 | (leave) | Physics 32 |
| 1989–90 | Physics 309 | Physics 52, Neuro 222($\frac{1}{3}$) | CSSS-SM,NN |
| 1990–91 | Physics 309, 399, LS 270 ₁ | Physics 231' | Physics 52 |
| 1991–92 | Physics 309 | Physics 231', LS 270 ₂ | |
| 1992–93 | Physics 230' | Physics 231' | |
| 1993–94 | Physics 230, LS 270 ₂ | Physics 231 | |
| 1994–95 | Physics 230 | Physics 231 | |
| 1995–96 | Physics 230 | Physics 231 | |
| 1996–97 | (sabbatical) | (sabbatical) | CSSS-PSP |
| 1997–98 | Physics 48 | Physics 304, 201($\frac{1}{4}$), LS 270 ₂ | |
| 1998–99 | Physics 48, 351 | (stroke) | |
| 1999–00 | Physics 48($\frac{1}{10}$), 351 | Physics 304 | |
| 2000–01 | Physics 230 | Physics 352 | |
| 2001–02 | Physics 230 | Physics 304 | |
| 2002–03 | Physics 230 | Physics 352 | |
| 2003–04 | Physics 230 | Physics 352 | |
| 2004–05 | Physics 230 | Physics 313 | |
| 2005–06 | Physics 230 | Physics 304 | |
| 2006–07 | Physics 230 | Physics 352 | |
| 2007–08 | (DGS) | Physics 318 | |
| 2008–09 | (DGS) | Physics 318 | |
| 2009–10 | (DGS) | Physics 318 | |
| 2010–11 | Physics 301 | Physics 391.03 | |
| 2011–12 | Physics 301 | Physics 304 | |
| 2012–13 | Physics 760, 771.03 | Physics 305 | |

3. Ph.D. Students

Amy J. Kolan, 1978–82

Ground State Studies of Spin Glass Models

F.T. Bantilan, 1978–82

Simulation and High-Temperature Series Studies for Spin Glasses

Jun Ye, 1986–92

Theoretical Studies of Glassy Relaxation

Ajay, 1986–91 (UNC-CH)

Relaxation Models for Glassy Systems

Departmental Activities (Duke University, 2003–2008)

Chair of Faculty Tenure Committee, 2005

Member of Faculty Appointment/Tenure Committees

Manager of Departmental e-mail lists, 1992–2007

Ombudsman for First Year Graduate Students, 2003

Member of Colloquium Committee, 2003

Member of Graduate Admissions Committee, 2004–2008

Chair of Graduate Admissions Committee, 2007–

Chair of Graduate Curriculum Committee, 2003–2005, 2007–

Director of Graduate Studies, 2007–

University Activities (Duke University, 2000–)

Director of the *Origins* FOCUS program, 1997–2001

Member of the FOCUS Advisory Board, 1997–2001

Professional Activities (2000–)

Refereeing—see page 2

Editorial Board Membership:

Journal Complexity, 1994–

Journal Information Sciences, 1997–2000

Journal Entropy, 1998–

Santa Fe Institute:

Member of the External Faculty, 1989–2003

Member of the Science Steering Committee, 1996–2000

Member of the Summer School Steering Committee, 1998–2000

BIBLIOGRAPHY

1. “Solidification Pressure of Nuclear and Neutron Star Matter”, P.W. Anderson and R.G. Palmer, *Nature Phys. Sci.* **231**, 145 (1971).
2. “Corresponding States Approach to Neutron Star Matter”, R.G. Palmer, unpublished, 1972.
3. “Exact Solution of the Mean Spherical Model for Charged Hard Sphere in a Uniform Neutralizing Background”, R.G. Palmer and J.D. Weeks, *J. Chem. Phys.* **58**, 4171 (1973).
4. “Comments on the Mean Spherical Model”, R.G. Palmer, unpublished, 1973.
5. “Theory of Nuclear Matter in Neutron Stars”, Ph.D. thesis, R.G. Palmer, unpublished, 1973.
6. “Are Neutron Star Cores Pion Condensates or Quantum Crystals?”, R.G. Palmer, E. Tosatti, and P.W. Anderson, *Nature Phys. Sci.* **245**, 119 (1973).
7. “Corresponding States Approach to Nuclear and Neutron-Star Matter”, R.G. Palmer and P.W. Anderson, *Phys. Rev.* **D9**, 3281 (1974).
8. “Positively Charged Isopin Wave Softening and Proton Lattice in Neutron Stars”, P.W. Anderson, N. Itoh, M.A. Alpar, E. Tosatti, and R.G. Palmer, *Lett. Nuovo Cimento* **12**, 165 (1975).
9. “Neutron Star Cores”, R.G. Palmer, *Astrophys. Space Sci.* **34**, 209 (1975).
10. “Solution of ‘Solvable Model of a Spin Glass’”, D.J. Thouless, P.W. Anderson, E. Lieb, and R.G. Palmer, unpublished, 1976.
11. “Textures of He³-A in a sphere: Topological Theory of Boundary Effects and a New Defect”, P.W. Anderson and R.G. Palmer, in *Quantum Fluids and Solids*, ed. Trickey, Adams, and Dufty (Plenum, 1977).
12. “Solution of ‘Solvable Model of a Spin Glass’”, D.J. Thouless, P.W. Anderson, and R.G. Palmer, *Phil. Mag.* **35**, 593 (1977).
13. “Comment on ‘The Third Law of Thermodynamics and the Theory of Spin Glasses’ by E.P. Wohlfarth”, P.W. Anderson, D.J. Thouless, and R.G. Palmer, *Phys. Lett.* **62A**, 456 (1977).
14. “The Mean Random Field approach to the Sherrington-Kirkpatrick problem”, R.G. Palmer, unpublished, 1977.
15. “The Replica Method and a Solvable Spin Glass Model”, J.L. van Hemmen and R.G. Palmer, *J. Phys. A* **12**, 563 (1979).

16. “Internal Field Distributions in Model Spin Glasses”, R.G. Palmer and C.M. Pond, *J. Phys. F* **9**, 1451 (1979).
17. “Charged Hard Sphere Results for the One-Component Plasma”, R.G. Palmer and G.A. Estevez, unpublished, 1979.
18. “Asymptotic Form of the Mean Spherical Approximation for the Internal Energy of the Classical One-Component Plasma”, H. Gould, R.G. Palmer, and G.A. Estevez, *J. Stat. Phys.* **21**, 55 (1979).
19. “Charged Hard Sphere Results for the One-Component Plasma”, R.G. Palmer, *J. Chem. Phys.* **73**, 2009 (1980).
20. “La Matière Mal Condensée”, *Science* **208**, 1025 (1980).
21. “Distribution of Frustrated Plaquettes in the Random Bond Square Lattice”, A.J. Kolan and R.G. Palmer, *J. Phys. C* **13**, L575 (1980).
22. “What’s Wrong with the Replica Method in Spin Glasses?”, J.L. van Hemmen and R.G. Palmer, in *Random Fields: Rigorous Results in Statistical Mechanics and Quantum Field Theory*, ed. Fritz, Lebowitz, and Szasz (North-Holland, 1981).
23. “Magnetic Properties of a Model Spin Glass and the Failure of Linear Response Theory”, F.T. Bantilan and R.G. Palmer, *J. Phys. F* **11**, 261 (1981).
24. “Ground State Properties of a Spin Glass Model”, A.J. Kolan and R.G. Palmer, *J. Appl. Phys. Phys.* **53**, 2198 (1982).
25. “The Thermodynamic Limit and the Replica Method for Short Range Random Systems”, J.L. van Hemmen and R.G. Palmer, *J. Phys. A* **15**, 3881 (1982).
26. “Broken Ergodicity”, R.G. Palmer, *Adv. Phys.* **31**, 669 (1982).
27. “‘Unlearning’ has a Stabilizing Effect in Collective Memories”, J.J. Hopfield, D.I. Feinstein, and R.G. Palmer, *Nature* **304**, 158 (1983).
28. “Broken Ergodicity in Spin Glasses”, R.G. Palmer, in *Heidelberg Colloquium on Spin Glasses*, ed. J.L. van Hemmen and I. Morgenstern (Springer, Berlin 1983 (*Lecture Notes in Physics* **192**, 234 (1983))).
29. “Models of Hierarchically Constrained Dynamics for Glassy Relaxation”, R.G. Palmer, D.L. Stein, E. Abrahams, and P.W. Anderson, *Phys. Rev. Lett.* **53**, 958 (1984).
30. “High Temperature Expansion for a Diluted Spin Glass Model”, R.G. Palmer and F.T. Bantilan, Jr., *J. Phys. C* **18**, 171 (1985).
31. “Palmer *et al.* Respond”, R.G. Palmer, D.L. Stein, E. Abrahams, and P.W. Anderson, *Phys. Rev. Lett.* **54**, 365 (1985).

32. “Broken Ergodicity in Glass”, R.G. Palmer and D.L. Stein, in *Relaxations in Complex Systems*, ed. K.L. Ngai and G.B. Wright (U.S. GPO, Washington 1985).
33. “Low and High Dimension Limits of a Phase Separation Model”, R.G. Palmer and H.L. Frisch, *J. Stat. Phys.* **38**, 867 (1985).
34. “Low-Frequency Relaxation in Ising Spin Glasses”, M. Randeria, J.P. Sethna, and R.G. Palmer, *Phys. Rev. Lett.* **54**, 1321 (1985).
35. “Parallels and Contrasts between Glass and Spin Glass”, R.G. Palmer, *Ann. N.Y. Acad. Sci.* **484**, 109 (1986).
36. “Transmission of Order in Some Unusual Dilute Systems”, J. Adler, R.G. Palmer, and H. Meyer, *Phys. Rev. Lett.* **58**, 882 (1987).
37. “Relaxation in Complex Systems”, R.G. Palmer, in *Heidelberg Colloquium on Glassy Dynamics*, ed. J.L. van Hemmen and I. Morgenstern (Springer-Verlag, Berlin 1987) [*Lecture Notes in Physics* **275**, 275 (1987)].
38. “Statistical Mechanics Approaches to Complex Optimization Problems”, R.G. Palmer, in *The Economy as an Evolving Complex System*, ed. P.W. Anderson, K.J. Arrow, and D. Pines (Addison-Wesley, Reading, 1988).
39. “Final Plenary Discussion”, R.G. Palmer, in *The Economy as an Evolving Complex System*, ed. P.W. Anderson, K.J. Arrow, and D. Pines (Addison-Wesley, Reading, 1988).
40. “Models for Glassy Relaxation”, R.G. Palmer, solicited by *Comm. Cond. Matt. Phys., Bull. Am. Phys. Soc.* **33**, 789 (1988) (abstract), and in preparation
41. “Constrained Kinetic Ising Models of Glasses”, W. Motyl, D.L. Stein, and R.G. Palmer, *Bull. Am. Phys. Soc.* **33**, 788 (1988) (abstract), and in preparation.
42. “Diffusion in sparse configuration spaces”, J. Ye and R.G. Palmer, *Bull. Am. Phys. Soc.* **33**, 788 (1988) (abstract).
43. “Nature of the Glass Transition”, D.L. Stein and R.G. Palmer, *Phys. Rev. B* **38**, 12035 (1988).
44. “The Role of Constraints in Glassy Relaxation”, R.G. Palmer, *Nucl. Phys. B* **5A**, 81 (1988).
45. “Models for Slow Relaxation in Glassy Systems”, R.G. Palmer, in *Cooperative Dynamics in Complex Physical Systems*, ed. H. Takayama (Springer-Verlag, Tokyo, 1988).
46. “Broken Ergodicity”, R.G. Palmer, in *Lectures in the Sciences of Complexity*, ed. D.L. Stein (Addison-Wesley, Reading, 1989).

47. “Neural Nets”, R.G. Palmer, in *Lectures in the Sciences of Complexity*, ed. D.L. Stein (Addison-Wesley, Reading, 1989).
48. “Glasses I: Phenomenology”, D.L. Stein and R.G. Palmer, in *Lectures in the Sciences of Complexity*, ed. D.L. Stein (Addison-Wesley, Reading, 1989).
49. “Glasses II: Models for Glassy Relaxation”, R.G. Palmer and D.L. Stein, in *Lectures in the Sciences of Complexity*, ed. D.L. Stein (Addison-Wesley, Reading, 1989).
50. “Mean Exit Times over Fluctuating Barriers”, D.L. Stein, R.G. Palmer, J.L. van Hemmen, and C.R. Doering, *Phys. Lett.* **A136**, 353 (1989).
51. “Can Physics Contribute to Economics?”, R.G. Palmer, *Bull. Santa Fe Inst.* **4**, 6 (1989).
52. “Escape Over A Fluctuating Barrier: The White Noise Limit”, D.L. Stein, C.R. Doering, R.G. Palmer, J.L. van Hemmen, and R.M. McLaughlin, *J. Phys. A* **23**, L203 (1990).
53. “Participant’s Manual for a Double Auction Tournament”, R.G. Palmer, J. Rust, and J.H. Miller, Santa Fe Institute, July 1989.
54. “A Double Auction Market for Computerized Traders”, J. Rust, R.G. Palmer, and J.H. Miller, Santa Fe Institute Working Paper, August 1989.
55. “Simulation of a Toy Model with Constrained Dynamics”, Ajay and R.G. Palmer, *J. Phys. A* **23**, 2139 (1990).
56. “Introduction to the Theory of Neural Computation”, J.A. Hertz, A.S. Krogh, and R.G. Palmer, (Addison-Wesley, Redwood City, 1991).
57. “Optimization on Rugged Landscapes”, R.G. Palmer, in *Molecular Evolution on Rugged Landscapes*, eds. A.S. Perelson and S.A. Kauffman (Addison-Wesley, Redwood City, 1991).
58. “Behavior of Trading Automata in a Computerized Double Auction Market (Preliminary Results)”, J. Rust, R.G. Palmer, and J.H. Miller, Santa Fe Institute Working Paper, April 1990.
59. “Santa Fe Institute’s Double Auction Tournament”, R.G. Palmer, J. Rust, and J. Miller, in *Rocket Science Made Simple*, (IBC, London, 1990).
60. “Behavior of Trading Automata in a Computerized Double Auction Market”, J. Rust, J. Miller, and R.G. Palmer, in *Double Auction Markets: Theory, Institutions, and Laboratory Evidence*, eds. D. Friedman and J. Rust, pp. 155–198 (Addison-Wesley, Redwood City, 1993).

61. “Applying Neural Networks to Resonance Search in High Energy Physics”, J. Rau, B. Müller, and R.G. Palmer, in *Proceedings of the Workshop on the Complex Dynamics of Neural Networks*, eds. J.G. Taylor and J.W. Clark (Springer, London, 1992).
62. “Characterizing Effective Trading Strategies: Insights from the Computerized Double Auction Tournament”, J. Rust, J. Miller, and R.G. Palmer, *J. Econ. Dynamics and Control* **18**, 61–96 (1993).
63. “The Process of Recurrent Choice”, D.G.S. Davis, J.E.R. Staddon, A. Machado, and R.G. Palmer, *Psych. Rev.* **100**, 320–341 (1993).
64. “Artificial Economic Life: a Simple Model of a Stockmarket”, R.G. Palmer, W.B. Arthur, J.H. Holland, B. LeBaron, and P.J. Tayler, *Physica* **D75**, 264–274 (1994).
65. “Book Review: An Introduction to the Modeling of Neural Networks—P. Peretto”, R.G. Palmer, *IEEE Trans. Neural Nets.* **5**, 527–8 (1994).
66. “Asset Pricing under Endogenous Expectations in an Artificial Stock Market”, W.B. Arthur, J.H. Holland, B. LeBaron, R.G. Palmer, and P.J. Tayler, in *The Economy As An Evolving Complex System II*, eds. W.B. Arthur, S. Durlauf, and D. Lane (Addison-Wesley, Redwood City, 1997).
67. “Asset Pricing under Endogenous Expectations in an Artificial Stock Market”, W.B. Arthur, J.H. Holland, B. LeBaron, R.G. Palmer, and P.J. Tayler, *Economic Notes (Siena)* **26**, 297–330 (1997).
68. “An Artificial Stock Market”, R.G. Palmer, W.B. Arthur, J.H. Holland, and B. LeBaron, *Artificial Life and Robotics* **3**, 27–31 (1999).
69. “Time Series Properties of an Artificial Stock Market”, B. LeBaron, W.B. Arthur, and R.G. Palmer, *J. Econ. Dynamics and Control* **23**, 1487–1516 (1999).
70. “Ground states for Large Samples of Two-Dimensional Ising Spin Glasses”, R.G. Palmer and Joan Adler, *Int. J. Modern Phys. C* **10**, 667–675 (1999).
71. “Error Estimation in the Histogram Monte Carlo Method”, M.E.J. Newman and R.G. Palmer, *J. Stat. Phys.* **97**, 1011–1026 (1999). [SFI 98–04–035, cond-mat/9804306].
72. “Interval timing as an emergent learning property”, V. Dragoi, J.E.R. Staddon, R.G. Palmer, and V.C. Buhusi, *Psych. Rev.* **110**, 126–144 (2003).
73. “Models of Extinction”, M.E.J. Newman and R.G. Palmer, (Oxford University Press, 2002).
74. “Upper and Lower Bounds on Spin-Glass Ground State Energies”, C Moore and R.G. Palmer, 2001 (unpublished).

Recent *Invited* Talks at Conferences and Workshops (1998 on)

1. “An Artificial Stock Market”, (invited talk), International Symposium on Artificial Life and Robotics, Beppu, Japan, January 19–21, 1998.
2. “Complex Systems”, (invited keynote address), Conference on Complexity and Biology, Milan, Italy, April 9, 1998.
3. “Auction Markets”, (invited talk), HP Conference on Agents, Artificial Life, and Economics, Bristol, England, June 24–25, 1998.
4. “Above and Below”, (invited talk), Conference on Integrative Themes in Complex Systems, Santa Fe, NM, July 20, 1998.
5. “Dynamics of Coadapting Agents”, (invited talk), Conference on Evolutionary Dynamics, Santa Fe, NM, October 9, 1998.
6. “Statistical Physics Approaches to Complex Systems”, (invited talk), International Conference on Complex systems, Nashua, NH, October 26, 1998.
7. “Complex Systems Theory Does Not Compute”, (invited talk), Joint Conference on Information Systems, Research Triangle Park, NC, October 28, 1998.
8. “Bricks Aren’t A House”, (invited talk), Conference on Disintegration Themes, SFI, Santa Fe, NM, July 23, 2001.
9. “Greedy Algorithms”, (invited talk), Workshop on Energy Landscapes: Structure, Dynamics and Optimization Algorithms, Telluride, CO, August 16, 2001.
10. “Frontiers in Algorithmic Complexity”, (invited round table), Workshop on Computational Complexity and Statistical Physics, LANL, Santa Fe, CO, September 5, 2001.
11. “Genetic Networks”, (invited talk), Workshop on Energy Landscapes: Structure, Dynamics and Optimization Algorithms, Telluride, CO, July 24–25, 2003.