Curriculum Vitae

Charles M. Marcus

Boeing Johnson Endowed Chair
Materials Science and Engineering and Department of Physics
University of Washington
Seattle, Washington 98195
cmarcus@uw.edu
(206) 883-5360

Villum Kann Rasmussen Professor
Niels Bohr Institute
University of Copenhagen
Copenhagen, Denmark

Born October 8, 1962, in Pittsburgh, PA (USA)

Current Research Interests

Experimental condensed matter physics
- Physical realizations of quantum information systems
- Topological materials and devices
- Superconductor-semiconductor hybrids
- Josephson junction arrays and related quantum simulation
- Quantum chaos
- Novel approaches to medical imaging

Education

Harvard University

PhD in Physics, 1990

Dissertation title: "Dynamics of Analog Neural Networks"

Stanford University

BS in Physics with Honors and Departmental Distinction, 1984

Employment

2023–	Boeing Johnson Endowed Chair, Materials Science and Engineering, and Department of Physics, University of Washington
2016–2021	Partner Research Manager and Site Director, Microsoft Quantum
2012–	Villum Kann Rasmussen Professor, Niels Bohr Institute, University of Copenhagen
2009–2010	Visiting Professor, Niels Bohr Institute, University of Copenhagen
2000–2012	Professor, Department of Physics, Harvard University
1999–2000	Associate Professor, Department of Physics, Stanford University

1992–1999 Assistant Professor, Department of Physics, Stanford University

Professional Activities

Board, Niels Bohr International Academy (NBIA) 2025-
Director, Northwest Quantum Nexus 2024-
Advisory Board, DFM, Denmark's Metrological Institute, 2024-
Co-Director, Thouless Institute for Quantum Matter, University of Washington, 2024-
Associate Chair, Materials Science and Engineering, University of Washington, 2024-
Guest Editor, Physical Review B, Collection in Honor of Emmanuel Rashba, 2023
Condensed Matter and Materials Research Committee, National Academy of Sciences, 2022-
Advisory Board, Helen Diller Quantum Center – Technion, Israel 2021-
Governing Advisory Board, Quantum Science Center, Oak Ridge National Laboratory 2020-2021
External Advisory Board, Quantum Foundry, UC Santa Barbara, 2019-2023
Board, Wallenberg Centre for Quantum Technology, 2018-2024
Scientific Advisory Board, KTH Center for Quantum Materials, Stockholm, Sweden
External Advisory Board, CUNY Advanced Science Research Center, NY, USA
Director, Center for Quantum Devices (DNRF Center of Excellence) 2012-2023
Scientific Director, Harvard Center for Nanoscale Systems, 2004-2009
Site Director, National Nanofabrication Infrastructure Network, 2004-2009
Scientific Advisory Board, QSIT, Swiss Federal Science Foundation Research Center
Scientific Advisory Board, Freiburg Institute of Physics, Freiburg, Germany
Organizer, Simons Research Conferences, 2012, 2014
External Advisory Board, Georgia Tech MRSEC
Executive Advisory Board, QIST Grand Challenge, Sandia National Laboratories
External Board, Physics Frontier Center, Joint Quantum Institute, University of Maryland 2008-2011
Director, School on Nano-Electronics, ICTP, Trieste, Italy, 2006
Organizer, Aspen School on Interactions, Coherence & Control in Mesoscopic Systems, 2006
Advisory Board, Theory Institute, Argonne National Laboratory
EU Quantum Information Processing IRC International Advisory Group
Advisory Board, Massachusetts Nanotechnology Initiative
Series Editor, Mesoscopic Physics, Oxford University Press
Advisory Board, Wonderfest, A Festival of Science
Director, Workshop on Quantum Systems Out of Equilibrium, ICTP, Trieste, Italy, 2004
Director, Workshop on Mesoscopic Physics and Electron Interactions, ICTP, Trieste, Italy, 2001
Director, Extended Workshop on Mesoscopic Physics, ICTP, Trieste, Italy, 1998
Organizer, National Academy of Sciences "Frontiers of Science", 1995

Awards and Honors

InstituteQ Chair of Excellence, Finnish Quantum Program, Finland, 2023-2025
H. C. Ørsted Gold Medal in Physics (only non-Danish recipient), 2020
Industry Prize, Danish Academy of Natural Sciences, 2019
Misel Family Lecturer, University of Minnesota, 2019
Einstein Colloquium, Weizmann Institute of Science, 2019
Member, National Academy of Sciences, 2018
Meservey Lecturer, MIT, 2018
Chapman Lecturer, Rice University, 2018
Research Excellence in Nanotechnology Award, University of Pennsylvania, 2014
Fellow, American Association for the Advancement of Science, 2013
Foreign member, Royal Danish Academy of Science and Letters, 2012
Aalto Lectureship, University of Helsinki, Helsinki, Finland, 2010
Poynting Lectureship, University of Birmingham, Birmingham, UK, 2010
Fellow, American Physical Society, 2009
AAAS Newcomb-Cleveland Prize, 2006
Ehrenfest Lecturer, Leiden University, 1997
NSF Presidential Faculty Fellow/PECASE 1997
ASSU Teaching Award, Stanford University, 1996
ARO Young Investigator Award, 1995
A. P. Sloan Foundation Fellowship, 1994
NSF Young Investigator Award, 1994
ONR Young Investigator Award, 1994
Terman Fellowship, Stanford University 1994
IBM Postdoctoral Fellowship, 1990
AT&T Bell Laboratories Ph.D. Scholarship, 1985
National finalist, Apker Award for Undergraduate Research in Physics, 1984
Rebecca L. Carrington Memorial Award, Physics Department, Stanford University, 1984
Member of Phi Beta Kappa, elected 1984
Fannie and John Hertz Foundation Scholarship, 1981
Valedictorian, Sonoma Valley High School, 1980

Patents

US Patent 8,119,032, Gas-phase functionalization of surfaces including carbon-based surfaces.
US Patent 8,377,419, Hyperpolarized solid materials with long spin relaxation times for use as imaging agents in magnetic resonance imaging.
US Patent 9,826,622, Reducing noise and temperature during measurements in cryostats.
US Patent 10,367,132, Nanoscale device comprising an elongated crystalline nanostructure.
US Patent 10,403,809, Manufacturing method for a nanostructured device using a shadow mask.

US Patent 10,720,562 Nanoscale device composing an elongated crystalline nanostructure.

US Patent 10,903,411 Semiconductor Josephson Junction and a Transmon Qubit Related Thereto.

Publications

Publications: 287
Citations: 49k (G. Scholar), 32k (WoS)
h-index: 112 (G. Scholar), 91 (WoS)

1. C. M. Marcus, Effect of low frequency ambient magnetic fields on the control unit and rf head of a commercial SQUID magnetometer, Rev. Sci. Instr. **55**, 1475 (1985).
2. C. M. Marcus and R. M. Westervelt, Basins of Attraction in Electronic Neural Networks, in Neural Information Processing Systems, edited by Dana Z. Anderson (AIP, New York, 1988).
3. S. H. Strogatz, C. M. Marcus, R. M. Westervelt, R.E. Mirollo, Simple Model of Collective Transport with Phase-Slippage, Physical Review Letters **61**, 2380 (1988).
4. C. M. Marcus and R. M. Westervelt, Stability of Analog Neural Networks with Delay, Physical Review A **39**, 347 (1989).
5. C. M. Marcus and R. M. Westervelt, Dynamics of Analog Neural Networks with Time Delay, in Advances in Neural Information Processing Systems, (Morgan Kauffman, San Mateo, 1989).
6. S. H. Strogatz, C. M. Marcus, R. M. Westervelt, R. E. Mirollo, Collective dynamics of coupled oscillators with random pinning, Physica D **36**, 23 (1989).
7. C. M. Marcus and R. M. Westervelt, Dynamics of iterated-map neural networks, Physical Review A **40**, 501 (1989).
8. C. M. Marcus, S. H. Strogatz, R. M. Westervelt, Delayed switching in a phase slip model of charge-density-wave transport, Physical Review B **40**, 5588 (1989).
9. F. R. Waugh, C. M. Marcus, R. M. Westervelt, Nonlinear dynamics of analog associative memory neural networks, 1990 International Joint Conference on Neural Networks, Washington, DC.
10. C. M. Marcus, F. R. Waugh and R. M. Westervelt, Associative memory in an analog iterated-map neural network, Physical Review A **41**, 3355 (1990).
11. F. R. Waugh, C. M. Marcus, R. M. Westervelt, Fixed-point attractors in analog neural computation, Physical Review Letters **64**, 1986 (1990).
12. C. M. Marcus and R. M. Westervelt, Stability and convergence of analog neural networks with multiple-time-step parallel dynamics, Physical Review A **42**, 2410 (1990).
13. F. R. Waugh, C. M. Marcus, R. M. Westervelt, Reducing neuron gain to eliminate fixed-point attractors in an analog associative memory, Physical Review A **43**, 3131 (1991).
14. C. M. Marcus, F. R. Waugh, R. M. Westervelt, Nonlinear Dynamics and Stability of Analog Neural Networks, Physica D **51**, 234 (1991).

15. C. M. Marcus, F. R. Waugh, R. M. Westervelt, Connection Topology and Dynamics in Lateral Inhibition Networks, in Advances in Neural Information Processing Systems 3, edited by D. S. Touretsky and R. Lipman (Morgan Kauffman, San Mateo, 1991).

16. C. M. Marcus, A. J. Rimberg, R. M. Westervelt, P. F. Hopkins, A. C. Gossard, Conductance Fluctuations and Chaotic Scattering in Ballistic Microstructures, Physical Review Letters **69**, 506 (1992).

17. A. V. M. Herz and C. M. Marcus, Collective Behavior of Feedback Networks with Distributed Dynamics, International Journal of Neural Systems, Vol. **3** (Supp.) (1992).

18. A. V. M. Herz and C. M. Marcus, Distributed Dynamics in Neural Networks, Physical Review E **47**, 2155 (1993).

19. C. M. Marcus, R. M. Westervelt, P. F. Hopkins, A. C. Gossard, Conductance Fluctuations as Chaotic Scattering, Proceedings of the Third Drexel Symposium on Quantum Nonintegrability, (Gordon and Breach, 1993).

20. C. M. Marcus, R. M. Westervelt, P. F. Hopkins, A. C. Gossard, Phase breaking in ballistic quantum dots: Experiment and analysis based on chaotic scattering, Physical Review B **48**, 2460 (1993).

21. C. M. Marcus, R. M. Westervelt, P. F. Hopkins, A. C. Gossard, Conductance fluctuations and quantum chaotic scattering in semiconductor microstructures, Chaos **3**, 643 (1994).

22. C. M. Marcus, R. M. Westervelt, P. F. Hopkins, A. C. Gossard, Conductance Fluctuations in a Quantum Dot in the Tunneling Regime: Crossover from Aperiodic to Regular Behavior, Surf. Sci. **305**, 480 (1994).

23. M. J. Berry, J. A. Katine, C. M. Marcus, R. M. Westervelt, A. C. Gossard, Weak Localization and Conductance Fluctuations in a Chaotic Quantum Dot, Surf. Sci. **305**, 495 (1994).

24. C. M. Marcus, R. M. Clarke, I. H. Chan, C. I. Duruöz, J. S. Harris, Phase-Breaking Rates from Conductance Fluctuations in a Quantum Dot, Sol. St. Sci. Tech. **9**, 1897 (1994).

25. C. I. Duruöz, R. M. Clarke, C. M. Marcus, J. S. Harris Jr., Conduction Threshold, Switching, and Hysteresis in Quantum Dot Arrays, Physical Review Letters **74**, 3237 (1995).

26. F. B. Mancoff, R. M. Clarke, C. M. Marcus, S. C. Zhang, K. Campman, A. C. Gossard, Magnetotransport of a Two-Dimensional Electron Gas in a Spatially Random Magnetic Field, Physical Review B **51**, 13269 (1995).

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30. J. A. Folk, S. R. Patel, S. F. Godijn, A. G. Huibers, S. M. Cronenwett, C. M. Marcus, K. Campman, A. C. Gossard, Statistics and Parametric Correlations of Coulomb Blockade Peak Fluctuations in Quantum Dots, Physical Review Letters **76**, 1699 (1996).

31. F. B. Mancoff, L. J. Zielinski, C. M. Marcus, K. Campman, A. C. Gossard, Shubnikov-de Haas Oscillations in a Two-Dimensional Electron Gas in a Spatially Random Magnetic Field, Physical Review B (RC) **53**, 7599 (1996).

32. S. R. Patel, S. M. Cronenwett, A. G. Huibers, M. Switkes, J. A. Folk, C. M. Marcus, K. Campman A. C. Gossard, Universal Fluctuations of Coulomb Blockade Peaks, Superlattices and Microstructures **21**, 43 (1997).

33. C. M. Marcus, J. A. Folk, S. R. Patel, S. M. Cronenwett, A. G. Huibers, K. Campman A. C. Gossard, Mesoscopic Fluctuations of Tunneling and Cotunneling in Quantum Dots, Superlattices and Microstructures **23**, 161 (1998).

34. C. M. Marcus, S. R. Patel, A. G. Huibers, S. M. Cronenwett, M. Switkes, I. H. Chan, R. M. Clarke, J. A. Folk, S. F. Godijn, K. Campman and A. C. Gossard, Quantum Chaos in Open versus Closed Quantum Dots: Signatures of Interacting Particles, Chaos, Solitons and Fractals **8**, 1261 (1997).

35. L. Zielinski, K. Chaltikian, K. Birnbaum, C. M. Marcus, K. Campman, A. C. Gossard, Advection of Classical Guiding Center Motion in a Random Magnetic Field, Europhys. Letters **42**, 73 (1998).

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38. S. M. Cronenwett, S. R. Patel, C. M. Marcus, K. Campman, A. C. Gossard, Mesoscopic Fluctuations of Elastic Cotunneling in Coulomb Blockaded Quantum Dots, Physical Review Letters **78**, 2312, (1997).

39. S. R. Patel, S. M. Cronenwett, D. R. Stewart, A. G. Huibers, C. M. Marcus, C. I. Durüoz, J. S. Harris, K. Campman, A. C. Gossard, Statistics of Peak Spacing Fluctuations, Physical Review Letters **80**, 4522 (1998).

40. D. R. Stewart, D. Sprinzak, C. M. Marcus, C. I. Durüoz, J. S. Harris, Correlation Between Ground and Excited State Spectra of a Quantum Dot, Science **278**, 1784 (1997).

41. M. Switkes, A. G. Huibers, C. M. Marcus, K. Campman, A. C. Gossard, High Bias Transport and Magnetometer Design in Open Quantum Dots, Applied Physics Letters **72**, 471 (1998).

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43. A. G. Huibers, M. Switkes, C. M. Marcus, K. Campman, A. C. Gossard, Dephasing in Open Quantum Dots, Physica B **249-251**, 348 (1998).

44. A. G. Huibers, C. M. Marcus, P. W. Brouwer, C. I. Durüoz, J. S. Harris Jr., Distributions of Conductance and its Parametric Derivatives in a Quantum Dot, Physical Review Letters **81**, 1917 (1998).

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47. C. M. Marcus, Feedback Control of a Quantum Dot, Proceedings of the 4th Experimental Chaos Conference, Boca Raton, FL (World Scientific, Singapore, 1998).

48. S. R. Patel, D. R. Stewart, C. M. Marcus, M. Gökçedag, Y. Alhassid, A. D. Stone, C. I. Duruöz, J. S. Harris, Jr., Changing the Electronic Spectrum of a Quantum Dot by Adding Electrons, Physical Review Letters **81**, 5900 (1998).

49. A. F. Morpurgo, D. B. Robinson, C. M. Marcus, Controlled Fabrication of Metallic Electrodes with Atomic Separation, Applied Physics Letters **74**, 2084. (1999).

50. M. Switkes, C. M. Marcus, K. Campman, A. C. Gossard, An Adiabatic Quantum Pump, Science **283**, 1905 (1999).

51. S. M. Maurer, S. R. Patel, C. M. Marcus, C. I. Duruöz, J. S. Harris, Jr., Coulomb Blockade Fluctuations in Strongly Coupled Quantum Dots, Physical Review Letters **83**, 1403 (1999).

52. A. G. Huibers, J. A. Folk, S. R. Patel, C. M. Marcus, C. I. Duruöz and J. S. Harris, Jr., Low-Temperature Saturation of the Dephasing Time and Effects of Microwave Radiation on Open Quantum Dots, Physical Review Letters **83**, 5090 (1999).

53. H. T. Soh, A. F. Morpurgo, J. Kong, C. M. Marcus, C. F. Quate, H. Dai, Integrated Nanotube Circuits: Controlled Growth and Ohmic Contacting of Single-Walled Carbon Nanotubes, Applied Physics Letters **75**, 627 (1999).

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57. A. F. Morpurgo, J. Kong, C. M. Marcus, H. Dai, Superconducting proximity effect in single-wall carbon nanotubes, Physica B **280**, 382-3 (2000).

58. J. A. Folk, S. R. Patel, K. M. Birnbaum, C. M. Marcus, C. I. Duruoz, J. S. Harris, Jr., Spin Degeneracy and Conductance Fluctuations in Open Quantum Dots, Physical Review Letters **86**, 2102 (2001).

59. B. I. Halperin, Ady Stern, Y. Oreg, J.H. Cremers, J. Folk, C.M. Marcus, Spin Orbit Effects in a GaAs Quantum Dot in a Parallel Magnetic Field, Physical Review Letters **86**, 2106 (2001).

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64. S. M. Cronenwett, H. J. Lynch, D. Goldhaber-Gordon, L. P. Kouwenhoven, C. M. Marcus, K. Hirose, N. S. Wingreen, V. Umansky, The Low-Temperature Fate of the 0.7 Structure in a Point Contact: A Kondo-like Correlated State in an Open System, Physical Review Letters **88**, 226805 (2002).

65. D. M. Zumbuhl, J. B. Miller, C. M. Marcus, K. Campman, A. C. Gossard, Spin-Orbit Coupling, Antilocalization, Parallel Magnetic Fields in Quantum Dots Physical Review Letters **89**, 276803 (2002).

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68. J. B. Miller, D. M. Zumbuhl, C. M. Marcus, Y. B. Lyanda-Geller, D. Goldhaber-Gordon, K. Campman, A. C. Gossard, Gate-Controlled Spin-Orbit Quantum Interference Effects in Lateral Transport, Physical Review Letters **90**, 076807 (2003).

69. J. M. Taylor, C. M. Marcus, M. D. Lukin, Long-lived memory for mesoscopic quantum bits, Physical Review Letters **90**, 206803 (2003).

70. Susan K. Watson, R. M. Potok, C. M. Marcus, V. Umansky, Experimental Realization of a Quantum Spin Pump, Physical Review Letters **91**, 258301 (2003).

71. R. M. Potok, J. A. Folk, C. M. Marcus, V. Umansky, M. Hanson, A. C. Gossard, Spin and Polarized Current from Coulomb Blockaded Quantum Dots, Physical Review Letters **91**, 016802 (2003).

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73. M. J. Biercuk, D. J. Monsma, C. M. Marcus, J. S. Becker, R. G. Gordon, A Low-Temperature Atomic Layer Deposition Liftoff Method for Microelectronic and Nanoelectronic Applications, Applied Physics Letters **83**, 2405 (2003).

74. Ian Appelbaum, K. J. Russell, V. Narayanamurti, D. J. Monsma, C. M. Marcus, M. P. Hanson, A. C. Gossard, H. Temkin, C. H. Perry, Ballistic Electron Emission Luminescence, Applied Physics Letters. **82**, 4498 (2003).

75. C. W. J. Beenakker, M. Kindermann, C. M. Marcus, A. Yacoby, Entanglement Production in a Chaotic Quantum Dot, cond-mat/0310199 (2003).

76. Ian Appelbaum, D. J. Monsma, K. J. Russell, V. Narayanamurti, C. M. Marcus, Spin-valve photodiode, Applied Physics Letters **83**, 3737 (2003).

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78. M. J. Biercuk, N. Mason, C. M. Marcus, Local Gating of Carbon Nanotubes, Nano Letters **4**, 1 (2004).

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83. L. DiCarlo, H. J. Lynch, A. C. Johnson, L. I. Childress, K. Crockett, C. M. Marcus, M. P. Hanson, A. C. Gossard, Differential Charge Sensing and Charge Delocalization in a Tunable Double Quantum Dot, Physical Review Letters **92**, 226801 (2004).

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85. D. M. Zumbuhl, C. M. Marcus, M. P. Hanson, A. C. Gossard, Cotunneling Spectroscopy in Few-Electron Quantum Dots, Physical Review Letters **93**, 256801 (2004).

86. S. O. Valenzuela, D. J. Monsma, C. M. Marcus, V. Narayanamurti, M. Tinkham, Spin Polarized Tunneling at Finite Bias, Physical Review Letters **94**, 196601 (2005).

87. D. M. Zumbuhl, J.B. Miller, D. Goldhaber-Gordon, C.M. Marcus, J.S. Harris, K. Campman, A.C. Gossard, Conductance Fluctuations and Spin Symmetries in Quantum Dots, Physical Review B **72**, 081305 (2005).

88. M. J. Biercuk, N. Mason, J. M. Chow, C. M. Marcus, Locally Addressable Tunnel Barriers within a Carbon Nanotube, Nano Letters **4**, 12 (2004).

89. K. J. Russell, Ian Appelbaum, Wei Yi, D. J. Monsma, F. Capasso, C. M. Marcus, V. Narayanamurti, M. P. Hanson, A. C. Gossard, Avalanche Spin-Valve Transistor, Applied Physics Letters **85**, 4502 (2004).

90. J. R. Petta, A. C. Johnson, A. Yacoby, C. M. Marcus, M. P. Hanson, A. C. Gossard, Pulsed-gate measurements of the singlet-triplet relaxation time in a two-electron double quantum dot, Physical Review B **72**, 161301(R) (2005).

91. J. R. Petta, A. C. Johnson, C. M. Marcus, M. P. Hanson, A. C. Gossard, Manipulation of a Single Charge in a Double Quantum Dot, Physical Review Letters **93**, 186802 (2004).

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