A. Alan Middleton
Curriculum Vitae, July, 2017

Department of Physics, Syracuse University, Syracuse, NY 13244
Phone: (315)443-3901, FAX: (315)443-9103, e-mail: aamiddle@syr.edu

Education

Princeton University	Ph.D., Physics, October 1990
Cambridge University	Certificate of Advanced Study (Mathematical Tripos Part III), June 1985
Harvey Mudd College	B.S., Physics and Mathematics, with Distinction, Honors in Physics and Mathematics, June 1984

Professional Employment

Jul. 2017 -	Associate Dean of Research and Scholarship, College of Arts & Sciences, Syracuse University
Jul. 2013 - Dec. 2017	Chair, Department of Physics, Syracuse University
2009 - 2013	Associate Chair, Department of Physics, Syracuse University
2008 -	Professor in the Department of Physics, Syracuse University
2001 - 2008	Associate Professor in the Department of Physics, Syracuse University
1995 - 2001	Assistant Professor in the Department of Physics, Syracuse University
1992 - 1994	Visiting scientist at the NEC Research Institute, Princeton, NJ
1990 - 1992	Research associate, Department of Physics, Syracuse University
1989 - 1990	Graduate Research Assistant, Department of Physics, Princeton University
Summer 1989	Theoretical Physics Department, AT&T Bell Labs, Murray Hill, NJ
1987-1989	Teaching Assistant, Department of Physics, Princeton University
Summer 1984	Research Assistant at IBM's San Jose Research Laboratory

Honors and Awards

Fellow of the American Association for the Advancement of Science (2017)
Fellow of the American Physical Society (2010)
Alfred P. Sloan Foundation Fellowship (1995)
Graduate Computational Physics award from Princeton University (1990)
National Science Foundation Graduate Fellowship (1984)
Churchill Scholar (1984)

Research Interests

Materials with disorder: ground states, barriers and metastable states in random materials such as spin glasses and other random magnets
Connections between algorithm dynamics, computer science analyses, including computational complexity, and physics
Transport in disordered materials, such as vortices in type-II superconductors, interface motion, and colloidal assemblies.
Algorithms for efficient simulation of complex dynamics, including heuristic coarse graining for glassy materials
Deriving visualizations and qualitative results from large scale simulations

Grants

Principal Investigator (PI)	"Algorithms, States, and Dynamics in Models of Disordered Matter", National Science Foundation, Division of Materials Research, $330,000, 2014-2018
PI	"Complex Dynamics and Algorithms for Disordered Matter", National Science Foundation, Division of Materials Research, $300,000, 2010-2014
Co-PI	"IGERT: Soft Interfaces - Bridging the Divide in Graduate Education", with Profs. Marchetti (PI), Mather, Ren, Ruhlandt, National Science Foundation, IGERT, $1,166,039, 2011-2016
PI	"Statics and Dynamics of Materials with Quenched Disorder", National Science Foundation, Division of Materials Research, $279,000, 2006-2010
PI	"Phases and Dynamics of Disordered Condensed Matter Systems", National Science Foundation, Division of Materials Research, $225,000, 2001-2005
Co-PI	"Statistical Physics and Computational Complexity", NSF DMR, under Information and Technology Research, with Profs. Bowick and Marchetti, $474,000, 2002-2007
PI	"Dynamics and Phase Space Structure of Condensed Matter Systems with Mesoscopic Degrees of Freedom", NSF DMR, $211,000, 1997-2001
Co-PI	"Information Science in the Service of Science Education", with Profs. Vidali, Catterall, Lipson, NSF Division of Undergraduate Education, $200,000, 1996-2000

I have also received, with Eric Schiff, an internal grant for $2,450 from the Syracuse University Faculty Instructional Grant Program (12/95) and have been awarded computer time from the National Partnership for Advanced Computational Infrastructure, from the Cornell Theory Center, and Brookhaven National Laboratory.

Administration and Service

Associate Dean of Research and Scholarship (July 2017 -) This position is primarily concerned with supporting research, discovery, and scholarship in the College of Arts and Sciences, which has about 336 faculty (215 tenured or tenure-track) in 17 academic units and sponsored expenditures of $16.8M in FY'16. In coordination with the Dean and the Dean's cabinet, I work with the Vice President for Research, the Dean of the Graduate School, department chairs, faculty, and other colleges/schools on opportunities in sponsored research and scholarship in both the Math and Sciences Division and the Humanities Division. I collaborate with Campus Planning, Design and Construction and also with offices such as the Office of Sponsored Programs. Support of research and scholarship and the College overall requires working with the College leadership team on a wide range of matters, including general administrative matters and strategic planning for the College.

Chair of the Department of Physics (July 2013 - December 2017) As Chair, I work with 30 faculty, 75 graduate students, 23 postdoctoral researchers, 15 staff members. The department had $7.9M in sponsored research expenditures in FY'17. We graduate about 17 majors in physics each year. As Chair, I have supported research infrastructure, attention to diversity, staff development, and the visibility of the department and individual faculty. I have worked with others on a significant restructuring of our staff to handle an increased volume of research administration, focused on facilitating teaching training for faculty and thorough assessment of our programs, overseen renovations of laboratories, common spaces, and our instructional clinic, sought the addition of Holden Observatory as teaching space, formalized some of our procedures, and advocated for significant publicity for our accomplishments. In this work, I have closely worked with the physics faculty, our students, the Dean's office, the Vice President for Research, Campus Planning, Design and Construction, the Provost's office, the Chancellor's office, SU ADVANCE (the National Science Foundation program to improve participation by women in the sciences and engineering), WISE (the faculty-organized Women In Science and Engineering program), the Syracuse Biomaterials Institute at Syracuse University, the College of Engineering and Computer Science faculty and administrators, tutoring centers, and other science departments.

Associate Chair of the Department of Physics (2009-2013) I served primarily as administrator for educational matters, planning courses and space and handling reports, student interactions, miscellaneous items such as office space, and curriculum matters, including course planning and assignment of teaching duties.

Director of Undergraduate Studies (2000-2007) During the time I held the position, the total number of majors rose from about 7 to 52, through efforts in collaborations with other faculty supporting the undergraduate program. My efforts involved planning for our program, recruiting and giving tours to prospective students, extensive advising, converting a room to an undergraduate lounge, curriculum development, increased assessment of our undergraduate program including extended exit interviews, attending conferences on teaching and program development, and assisting the chair with teaching assignments and course schedules. I continue to be involved in undergraduate education and planning. I maintain contacts with the New Faculty Workshop network and gave an invited talk on teaching at the 2009 APS March Meeting.

Committees

- I am currently serving (Nov. 2016 -) on the Faculty Salary Review Committee for Syracuse University. This group has gathered and reviewed internal and external comparisons on salary, to review the salaries of full-time faculty for fairness, competitiveness, and equity. The committee will summarize our findings and make recommendations to the Provost and Vice-Chancellor.

- I was the Faculty Sponsor for the Syracuse University Travel Team (2015-2016) which reviewed and made substantial revisions to the University's Travel Policy, in order to achieve savings and efficiency and in response to community input on travel matters. In my role, I coordinated the work of the committee along with the committee co-chairs, the Director of Purchasing and the Comptroller, and the Administrative Sponsor (the Chief Financial Officer for Syracuse University).

- I have served on the College of Arts and Sciences Faculty Council (2014-2016) and as its chair (2015-

2016). This committee met to set the agenda for faculty meetings and to otherwise handle matters on behalf of the faculty outside of major college faculty meetings, including making committee assignments, developing revisions to bylaws and procedures, and discussing general business of importance to the faculty.

- I served as a member of the search committee for the Dean of the College of Engineering and Computer Science (Oct. 2014 - Apr. 2015).
- I have served on a number of departmental and college committees, including search committees, curriculum committees, scholarship committees, the qualifying examination committee, and faculty review committees, including promotion and tenure committees.
- I have served several times on the Coronat Selection Committee, most recently three consecutive years through 2017, which reviews applications and then interviews and recruits students on campus for the College of Arts and Science's largest merit award.
- I have served on the Arts and Sciences College Promotion and Tenure Committee for one year (2008-09).
- I served on the Core Faculty of Renee Crown University Honors Program (2009-15), and have served on and chaired the capstone prize committee (2012, 2013).
- I am serving on the Syracuse University Senate as a representative of the College of Arts and Sciences (2016-).

Teaching and Outreach

I have developed and taught courses ranging from large introductory science courses to graduate quantum mechanics. I have invested large amounts of time in each course developing new approaches to the content and updating the material. My methods involve interactions with students, deemphasizing long presentations and including conversations, white board work in pairs, and frequent student feedback. I have created an Honors Course, "Seeing Light", that involves dedicated students (primarily not science majors) in a historical, experimental, and philosophical discussion of vision and light, through color, images, quantum physics, and relativity. The computational course has less emphasis than traditional on numerical methods and instead focuses on developing problem solutions through using existing tools and object-oriented programming. I received the "Lunch on the Department" award for upper division undergraduate teaching in 2012 for teaching undergraduate statistical physics.

Undergraduate courses

"Science for the 21st Century", a lecture and lab course, focused on light and matter including applications to nuclear weapons and liquid crystal displays

"Science and Computers", an upper division computer-lab oriented course emphasizing visualization and simulations

"Statistical Mechanics and Thermodynamics", a course for juniors and seniors

"Journal Workshop in Physics", a course for new majors that introduces them to landmark papers and research and careers in physics

"Problem Solving in Contemporary Physics", a course for seniors including problem solving skills and career & graduate school opportunities

"Seeing Light", an honors course for a variety of majors that reviews the history of theories of light and vision and modern applications

"First-year forum", a short seminar course for incoming students

"Major Concepts of Physics II"', a core course for non-majors, co-taught.

Graduate Courses

"Science and Computers", using C++ and Unix tools to solve scientific problems

"Quantum Mechanics II", including my addition of MRI and quantum communication

"Condensed Matter Physics", based on Chaikin & Lubensky

"Solid State Physics", traditional crystals, band structure, superconductivity
Community Outreach and Service
Public science lectures on campus
Visits to local schools, for physics demonstrations (> twice/year)
Guest on local PBS show to discuss chaos
Interview on local morning radio program to explain double rainbows
Talk on "The Spectacular Science of Six-Sided Snow" at the Museum of Science and Technology
Arrange for visits by local high school students to shadow faculty and staff researchers
Co-organier for the 2001 Boulder School in Condensed Matter Physics
Article on and AAPT prize for demonstration on color mixing

Graduate students: David McNamara, Shantenu Jha, Berta-Elizabeth Rodriguez-Milla, Creighton Thomas, Sean Sweeney, Jie Yang.

Post-doctoral associates: Chen Zeng, Thomas Prellberg, Karl Saunders, Jennifer Schwarz, Jan Meinke.

I have also worked on research projects with undergraduate students and taught undergraduate and graduate independent study courses.

Service to the research community

- Co-organizer of the 2001 Boulder School, the 2008 Aspen Center for Physics Workshop "Complexity, Disorder, and Algorithms", the 2012 Aspen Workshop "Disorder, Algorithms, and Complexity", and the 2018 Kavli Institute for Theoretical Physics Workshop "Memory Formation in Matter". Chair of an abstract sorters group for the 2010 APS March Meeting.
- Regular reviewer for Physical Review Letters, Physical Review X, Physical Review E, Physical Review B, JSTAT, Europhysics Letters, and other journals.
- Grant reviewer and panel participant for the National Science Foundation and Department of Energy. Served on the High Performance Computing review panel for the NSF Mathematical and Physical Sciences Division (2005).

Invited Talks

2006: Joint LPTENS/Jussieu seminar in Paris, France, Invited participant and talk at the International Centre for Theoretical Physics, Trieste, Italy, Invited participant and talk at Max Planck Institute for Complex Systems, Dresden, Germany, Invited participant and talk at Kavli Institiute for Theoretical Physics (Oct-Dec.), George Washington University. 2007: Institute for Pure and Applied Mathematics at UCLA, Los Alamos National Laboratory, Central New York Workshop on Complex Matter [Also invited participant at Aspen Center for Physics, July 2005 & July 2007, invited participant at American Institute of Mathematics Workshop, August, 2006], Syracuse University. 2008: Louisiana State University Center for Computation and Technology, Kavli Institute of Theoretical Physics in China, Los Alamos National Laboratory, University of Massachussetts Amherst. 2009: 101st Statistical Mechanics Meeting at Rutgers (May), Physics of Algorithms Workshop in Santa Fe, NM (Sept.). 2010: American Physical Society March Meeting (Portland, OR); 104th Statistical Mechanics Meeting at Rutgers (December). 2011: Washington University in St. Louis, Kavli Institute for Theoretical Physics China (Beijing), University of Science and Technology of China (Hefei). 2012: "Quantum Information Meets Statistical Physics" conference, Innsbruck, Austria. August, 2013: Invited speaker at Santa Fe Institue ("Deep Computation in Statistical Physics") and at a symposium in honor of Dan Stein at New York University. 2014: Kavli Institute of Theoretical Physics, invited speaker at workshop on "Complexity and Mechanics"; Invited workshop speaker, "Classical and Quantum Optimization", Zurich; Invited session speaker, March Amercian Physical Society Meeting. 2016: "Workshop on Physics Informed Machine Learning", Santa Fe, NM; 116th Statistical Mechanics Conference, Rutgers University.

PUBLICATIONS

[Also see aamiddle.expressions.syr.edu for latest list, source code, and gallery]

1. "Minimal spanning trees at the percolation threshold: A numerical calculation",
   Physical Review E **88**, 032129 (2013)
   Sean M. Sweeney, A. Alan Middleton.

2. "Extracting thermodynamic behavior of spin glasses from the overlap function",
   Physical Review B **87**, 220201 (2013)
   A. Alan Middleton.

3. "Numerically exact correlations and sampling in the two-dimensional Ising spin glass",
   Physical Review E **87**, 043303 (2013), Creighton K. Thomas, A. Alan Middleton.

4. "Zero and low temperature behavior of the two-dimensional $\pm J$ Ising spin glass",
   Physical Review Letters **107**, 047203 (2011),
   Creighton K. Thomas, David A. Huse, A. Alan Middleton.

5. "Chaos and universality in two-dimensional Ising spin glasses",
   preprint archived as `cond-mat/1012.3444`,
   Creighton K. Thomas, David A. Huse, A. Alan Middleton.

6. "Exact Algorithm for Sampling the 2D Ising Spin Glass",
   Physical Review E **80**, 046708 (2009),
   Creighton K. Thomas, A. Alan Middleton.

7. "Statistics of static avalanches in a random pinning landscape",
   Physical Review B **79**, 050101 (2009),
   Pierre Le Doussal, A. Alan Middleton, Kay Joerg Wiese.

8. "Persistence and Memory in Patchwork Dynamics for Glassy Models",
   Physical Review B **77**, 092415 (2008),
   Creighton K. Thomas, Olivia L. White, A. Alan Middleton.

9. "Matching Kasteleyn Cities for Spin Glass Ground States",
   Physical Review B **76**, 220406(R) (2007),
   Creighton K. Thomas, A. Alan Middleton.

10. "Are Domain Walls in Spin Glasses Described by Stochastic Loewner Evolution?",
    Physical Review B **76**, 020403(R) (2007),
    D. Bernard, P. Le Doussal, A. Alan Middleton.

11. "Irrational mode locking in quasiperiodic systems",
    Physical Review Letters **98**, 148001 (2007),
    Creighton K. Thomas, A. Alan Middleton.

12. "Measuring functional renormalization group fixed-point functions for pinned manifolds",
    Physical Review Letters **98**, 155701 (2007),
    A. Alan Middleton, P. Le Doussal, and K. J. Wiese,

13. "Effects of Disorder on Electron Transport in Arrays of Quantum Dots",
    preprint with S. Jha, http://arxiv.org/abs/cond-mat/0511094.

14. "Linking Physics and Algorithms in the random-field Ising model",
    preprint with Meinke, http://arxiv.org/abs/cond-mat/0502471.

15. "Exploring optimization for the random-field Ising model",
preprint archived as cond-mat/0501269,
D. Clay Hambrick, Jan H. Meinke, A. Alan Middleton.

16. "Counting States and Counting Operations",
Chapter 5 (pp. 71-100) in *New Optimization Algorithms in Physics*,
Eds. Hartmann and Rieger, Wiley-VCH (2004),
A. Alan Middleton.

17. "Improved extremal optimization for the Ising spin glass",
Physical Review E **69**, 055701 (2004),
A. Alan Middleton.

18. "Mean Field Theory of Collective Transport with Phase Slips",
Physical Review B **70**, 024205 (29 pp., 2004),
Karl Saunders, J. M. Schwarz, M. Cristina Marchetti, A. Alan Middleton.

19. "Percolation of unsatisfiability in finite dimensions",
Physical Review E **70**, 035103(R) (4pp., 2004),
J. M. Schwarz and A. Alan Middleton.

20. "Driven depinning of strongly disordered media and anisotropic mean-field limits",
Physical Review Letters **91**, 107002 (4 pp., 2003),
M. Cristina Marchetti, A. Alan Middleton, Karl Saunders, J. M. Schwarz.

21. "The three-dimensional random field Ising magnet: interfaces, scaling,and the nature of states",
Physical Review B **65**, 134411 (31 pp., 2002),
A. Alan Middleton and Daniel S. Fisher.

22. "Critical slowing down in polynomial time algorithms",
Physical Review Letters **88**, 017202 (4 pp., 2002),
A. Alan Middleton.

23. "Scaling, domains, and states in the four-dimensional random field Ising magnet",
preprint archived as cond-mat/0208182,
A. Alan Middleton.

24. "Energetics and geometry of excitations in random systems",
Phys. Rev. B **63**, 060202(R) (4 pp., 2001),
A. Alan Middleton.

25. "Viscoelastic Depinning of Driven Systems: Mean-Field Plastic Scallops",
Physical Review Letters **85**, 1104-1107 (2000),
M. Cristina Marchetti, A. Alan Middleton, Thomas Prellberg.

26. "Disorder-Induced Topological Defects in a d=2 Elastic Medium atZero Temperature",
Physical Review B **61**, 14787-14790 (2000),
A. Alan Middleton.

27. "Numerical investigation of the thermodynamic limit for ground states in models with quenched disorder",
Physical Review Letters **83**, 1672-1675 (1999),
A. Alan Middleton.

28. "Simulation of the Zero Temperature Behavior of a 3-Dimensional Elastic Medium",
Phys. Rev. B **60**, 10062-10069 (1999),
David McNamara, A. Alan Middleton, Chen Zeng.

29. "Computational Complexity of Determining the Barriers to Interface Motion in Random Systems",
Physical Review E **59**, 2571-2577 (1999),
A. Alan Middleton.

30. "Statistical Topography of Glassy Interfaces",
Physical Review Letters **80**, 109-112 (1998),
Chen Zeng, Jané Kondev, David McNamara, and A. Alan Middleton.

31. "Ground-State Roughness of the Disordered Substrate and Flux Lines in d=2",
Physical Review Letters **77**, 3204-3207 (1996),
Chen Zeng, A. Alan Middleton, Y. Shapir.

32. "Vortex Dynamics and Defects in Simulated Flux Flow",,
Physical Review B **54**, 12427-12436 (1996),
Michael C. Faleski, M. Cristina Marchetti, and A. Alan Middleton.

33. "Numerical Results for the Ground-State Interface in a Random Medium",
Physical Review **E52**, R3337 (1995).
A. Alan Middleton.

34. "Self-Organized criticality in non-conserved systems",
Physical Review Letters **74**, 742 (1995).
A. Alan Middleton and Chao Tang.

35. "Avalanches and the renormalization group for pinned charge-density waves",
Physical Review B **49**, 244 (1994).
Onuttom Narayan and A. Alan Middleton.

36. "Collective Transport in Arrays of Small Metallic Dots",
Physical Review Letters **71**, 3198 (1993).
A. Alan Middleton and Ned S. Wingreen.

37. "Scaling Near Mode Locking in a Charge Density Wave Conductor",
Physical Review Letters **70**, 3784 (1993).
Mark J. Higgins, A. Alan Middleton, and S. Bhattacharya.

38. "Critical Behavior of Charge Density Waves Below Threshold: Numerical and Scaling Analysis",
Physical Review B **47**, 3530 (1993).
A. Alan Middleton and D. S. Fisher.

39. "Self-Organization and a Dynamical Transition in Traffic-flow Models,"
Physical Review A **46**, R6124 (1993).
Ofer Biham, A. Alan Middleton, and Dov Levine.

40. "Elastic String in a Random Potential,"
Physical Review Letters **70**, 662 (1993).
M. Dong, A. Alan Middleton, M. Cristina Marchetti, and Valerii Vinokur.

41. "Dynamics of Directed Polymers with Cutting Interactions,"
Physical Review A **45**, 7288 (1992).
Sergei E. Esipov and A. Alan Middleton.

42. "Thermal Rounding of the Charge Density Wave Depinning Transition,"
Physical Review B **45**, 9465 (1992).
A. Alan Middleton.

43. "Complete Mode-locking in Models of Charge-density Waves,"
Physical Review Letters **68**, 1586 (1992).
A. Alan Middleton, Ofer Biham, Peter B. Littlewood, and Paolo Sibani.

44. "Asymptotic Uniqueness of the Sliding State for Charge DensityWaves,"
Physical Review Letters **68**, 670 (1992).
A. Alan Middleton.

45. Reply to comment on "Critical Behavior of Pinned Charge-Density Waves below the Threshold for Sliding,"
Physical Review Letters **67**, 3873(1991).
A. Alan Middleton, Daniel S. Fisher, and Peter B. Littlewood.

46. "Critical Behavior of Pinned Charge-Density Waves below the Threshold for Sliding,"
Physical Review Letters **66**, 92 (1991).
A. Alan Middleton and Daniel S. Fisher.

47. "Discrete Scatterers and Autocorrelations of Multiply Scattered Light,"
Physical Review B **43**, 5934 (1991).
A. Alan Middleton and Daniel S. Fisher.

48. "$^{11}B(\alpha, p)^{14}C^*$ ($E_x = 23.288$ MeV) reactionand (p, π^+) production mechanisms,"
Physical Review C **38**, 1958 (1988).
L. K. Herold, K. E. Luther, A. A. Middleton, M. L. Pitt, andJ. D. Brown.

49. "The Deconfining Transition for Finite-temperature $U(1)$ LatticeGauge Theory in $(2+1)$ Dimensions,"
Physics Letters **B175**, 64 (1986).
P. Coddington, A. Hey, A. A. Middleton, and J. Townsend.