Aaron Wynveen
Curriculum Vitae

Present Address:	School of Physics and Astronomy
	University of Minnesota
	116 Church Street SE
	Minneapolis, MN 55455
	United States of America
Telephone:	+1 (612) 625-9072
Fax:	+1 (612) 624-4578
E-mail:	wynveen@physics.umn.edu
	a.wynveen@googlemail.com

EDUCATION

Ph. D. in Theoretical and Computational Condensed Matter Physics (2002)
University of Minnesota, Minneapolis, MN, USA
Advisor: Prof. J. Woods Halley
Thesis Title: *Scattering Processes in Bose-Einstein Condensed Systems*

M. S. in Physics (1995)
University of Michigan, Ann Arbor, MI, USA
Advisor: Prof. Roberto Merlin
Emphasis in experimental condensed matter physics.

B. S. in Physics, *summa cum laude* **(1993)**
Minors in Mathematics and Mathematical Economic Theory
University of Minnesota, Minneapolis, MN, USA
Advisor: Prof. James Kakalios

ACADEMIC EMPLOYMENT

Teaching Associate Professor, University of Minnesota, 2016-present
Lecturer, University of Minnesota, 2010-2016
Lecturing a variety of large undergraduate physics courses, primarily for students pursuing degrees in biology/medicine or physical sciences/engineering. Carrying out undergraduate course development. Continuing studies [with collaborators at Imperial College London and the Nat'l. Institutes of Health (USA)] of DNA interactions. Also continuing studies of generic polarizable media in aqueous solutions. Undertaking studies of a tight-binding water model and evolutionary models for "chemistries of life".

Research Fellow, Alexander von Humboldt Foundation,
Institute for Theoretical Physics II, Heinrich-Heine-University Düsseldorf, 2007-2009
Studied a variety of soft matter problems in the context of biological systems. Undertook computational and analytical studies of DNA molecular recognition, interactions and

structure. Continued research of the interactions of generic polarizable media in aqueous electrolytic solutions, in which I advised master's and undergraduate students. Initiated statistical mechanical/computational studies of DNA polyelectrolyte brushes. Probed the effects of discrete solvent on the conformations and interactions of polyelectrolyte chains.

Research Associate, Royal Society Grant,
Dept. of Chemistry, Imperial College London, 2003-2007
Carried out analytical and computational studies of DNA interactions and aggregation in the Alexei Kornyshev group in conjunction with a group at the Nat'l Institutes of Health in Bethesda and an experimental group at Imperial. Calculated the role of nonlinear effects and thermal fluctuations in the interactions between DNA molecules. Mapped DNA assemblies onto magnetic models to describe molecular structural and orientational ordering. Developed models for polarizable media in molecular dynamics simulations to understand role of hydrostatic interactions in biological systems. Co-advised graduate students. Acted as administrator for a multinode Beowulf cluster. Taught maths/theoretical physics lab course for undergraduate chemists and assisted in tutorials.

Lecturer, University of Wisconsin – River Falls, 2002-2003
Taught a number of undergraduate physics courses, including "Basic Physics" for non-science majors, "General Physics" for science majors, "General Physics Laboratory", and "Solid State Physics" for advanced physics major. Duties included lecturing, course development, grading, running laboratories, and serving on senior project committees.

Graduate Research Assistant, University of Minnesota, 1998-2002
Carried out theoretical research of strongly coupled and weakly interacting Bose condensed systems. Studied the predicted condensate mediated process in these systems. Calculated the elastic and inelastic cross sections for scattering from a weakly interacting Bose condensed alkali system. Developed a gas dynamics simulation, which can be used in conjunction with hydrodynamics models, to characterize low energy helium beams which are to be used in an experiment to probe Bose-Einstein condensation in bulk superfluid helium. Acted as computer administrator for research group: building and installing computer systems, upgrading software, maintaining a number of machines.

Graduate Teaching Assistant, University of Minnesota, 1997-2002
Taught undergraduate lab courses and assisted undergraduate physics majors from various colleges involved in the Research Experience for Undergraduates program during the summers. Head TA for an undergraduate course with duties ranging from course administration, overseeing other TA's, to filling in for the faculty lecturer when needed.

HONORS, AWARDS, AND ACTIVITIES

Journal reviewer for Physical Review, Royal Society of Chemistry, American Chemical Society, European Physical Journal, Institute of Physics, etc. Presented invited and contributed talks at many international scientific conferences. **Alexander von Humboldt Fellowship**, Heinrich-Heine-Universität Düsseldorf (2007-2009). **Royal Society Grant** for carrying out theoretical and computational studies of biophysical systems at Imperial College London (2003-2007). **Aneesur Rahman Prize** for exceptional Ph.D. dissertation,

University of Minnesota (2002). **Graduate School Doctoral Dissertation Fellowship**, University of Minnesota (2001-2002). **NASA GSRP Fellowship**, University of Minnesota (1999-2000). **Physics Teaching Assistant of the Year** award, University of Minnesota (1997-1998). Semifinalist, **University-wide Teaching Assistant of the Year**, University of Minnesota (1997-1998). **Regents Fellowship**, University of Michigan (1993-1995). Elected to **Graduate Physics Society** standing committee, University of Michigan (1994-1995). **Graduating Physics Student of the Year**, University of Minnesota (1993). **Institute of Technology Merit Scholarship**, University of Minnesota (1991-1992). **Harry and Viola St.Cyr Research Scholarship in Physics**, University of Minnesota (1990-1991). **Dean's List** each term, University of Minnesota (1988-1992).

RELEVANT SKILLS

Computer related:

• Proficient in Fortran77/90. Familiar with C, C++ and parallel coding (MPI).

• Familiar with a number of Unix platforms such as Linux, IRIX, and SunOS. Have also worked with a variety of Windows and MacOS distributions.

• Have utilized a variety of software, including the Microsoft Office Suite of programs, Matlab, Mathematica, a number of plotting and illustrating packages, and a few molecular dynamics applications.

• Maintained a number of these systems (building, installation, security, networking and general upkeep) including a local Beowulf cluster and Condor network.

• Applied to and earned time on a variety of supercomputers at a number of institutions (University of Minnesota Supercomputing Institute, NASA JPL, Materials Chemistry Consortium HPCx, Imperial College Parallel Computing Centre, etc.)

Teaching:

• Lectured large introductory courses ($\sim$ 500-900 students each year), managing dozens of teaching assistants, and undertook course development at the University of Minnesota.

• Advised master's and bachelor candidates, Düsseldorf.

• Assisted in course development, taught undergraduate maths labs courses, co-advised PhD students, and covered tutorials in the Chemistry Department at Imperial College London.

• Taught introductory and advanced physics courses, designed laboratories, and advised students at the University of Wisconsin – River Falls.

• Undergraduate and graduate teaching assistant for undergraduate and graduate level physics, economics, and mathematics courses at the Universities of Michigan and Minnesota.

• Advised undergraduate researchers in physics during the summers at the University of Minnesota. Found research groups for students; organized field trips; taught GRE preparation course.

PUBLICATIONS

37. "Theory of phase segregation in DNA assemblies containing two different base-pair sequence types", D. J. O'Lee, A. Wynveen, and A. A. Kornyshev, New Jour. of Phys. **19**, 015014 (2017).

36. "Effects of spatial diffusion on nonequilibrium steady states in a model for prebiotic evolution", B. F. Intoy, A. Wynveen, and J. W. Halley, Phys. Rev. E **94**, 042424 (2016).

35. "Which way up? Recognition of homologous DNA segments in parallel and antiparallel alignments", D. J. Lee, A. Wynveen, T. Albrecht, and A. A. Kornyshev, J. Chem. Phys. **142**, 045101 (2015).

34. "Nonequilibrium steady states in a model for prebiotic evolution", A. Wynveen, I. Fedorov, and J. W. Halley, Phys. Rev. E **89**, 022725 (2014).

33. "The structure of ionic aqueous solutions at interfaces: an intrinsic structure analysis", F. Bresme, E. Chacón, P. Tarazona, and A. Wynveen, J. Chem. Phys. **137**, 114706 (2012).

32. "Self consistent tight binding model for dissociable water", Y. Lin, A. Wynveen, J. W. Halley, L. A. Curtiss, and P. C. Redfern, J. Chem. Phys. **136**, 174507 (2012).

31. "Signatures of DNA flexibility, interactions and sequence-related structural variations in classical X-ray diffraction patterns", A. A. Kornyshev, D. J. Lee, A. Wynveen, and S. Leikin, Nucleic Acids Research **39**, 7289 (2011).

30. "Properties of alkali-halide salt solutions about polarizable nanoparticle solutes for different ion models", A. Wynveen and F. Bresme, J. Chem. Phys. **133**, 144706 (2010).

29. "Undulations enhance the effect of helical structure on DNA interactions", D. J. Lee, A. Wynveen, A. A. Kornyshev, and S. Leikin, J. Phys. Chem. B **114**, 11668 (2010).

28. "The effects of pH, salt and bond stiffness on charged dendrimers", S. Huißmann, A. Wynveen, C. N. Likos, and R. Blaak, J. Phys.: Condens. Matter **22**, 232101 (2010).

27. "Fluctuations and interactions of semi-flexible polyelectrolytes in columnar assemblies", D. J. Lee, S. Leikin, and A. Wynveen, J. Phys.: Condens. Matter **22**, 072202(R) (2010).

26. "Interactions between planar polyelectrolyte brushes: effects of stiffness and salt", A. Wynveen and C. N. Likos, Soft Matter **6**, 163 (2010).

25. "Interactions between planar rigid polyelectrolyte brushes", A. Wynveen and C. N. Likos, Phys. Rev. E **80**, 010801(R) (2009).

24. "DNA Double Helices Recognize Mutual Sequence Homology in a Protein Free Environment", G. S. Baldwin, N. J. Brooks, R. E. Robson, A. Wynveen, A. Goldar, S. Leikin, J. M. Seddon, and A. A. Kornyshev, J. Biomol. Struct. Dyn. **26**, 880 (2009).

23. "The homology recognition well as an innate property of DNA structure", A. A. Kornyshev and A. Wynveen, Proc. Nat'l. Acad. Sci. USA **106**, 4683 (2009).

22. "Computer simulations of charged star polymers and brushes", C. N. Likos, R. Blaak, and A. Wynveen, J. Phys.: Condens. Matter **20**, 494221 (2008).

21. "Helical coherence of DNA in crystals and solution", A. Wynveen, D. J. Lee, A. A. Kornyshev, and S. Leikin, Nucleic Acids Research **36**, 5540 (2008).

20. "DNA double helices recognize mutual sequence homology in a protein free environment", G. S. Baldwin, N. J. Brooks, R. E. Robson, A. Wynveen, A. Goldar, S. Leikin, J. M. Seddon, and A. A. Kornyshev, J. Phys. Chem. B. **112**, 1060 (2008). [Featured in Nature Research Highlights, Science Editors' Choice and other news sources]

19. "Interactions of polarizable media in water and the hydrophobic interaction" in *Aspects of Physical Biology: Biological Water, Protein Solutions, Transport and Replication*, F. Bresme and A. Wynveen, "Lecture Notes in Physics", vol. 752, pp. 43-62, edited by G. Franzese and M. Rubi (Springer-Verlag, Berlin, 2008).

18. "On the influence of solute polarizability on the hydrophobic interaction", F. Bresme and A. Wynveen, J. Chem. Phys. **126**, 044501 (2007).

17. "Possible transmission experiments with low velocity helium droplets", A. Wynveen, K. A. Lidke, Y. Lutsyshyn, and J. W. Halley, Phys. Rev. B **75**, 054506 (2007).

16. "Structure and interactions of biological helices", A. A. Kornyshev, D. J. Lee, S. Leikin, and A. Wynveen, Rev. Mod. Phys. **79**, 943 (2007).

15. "Interactions of polarizable media in water: A molecular dynamics approach", A. Wynveen and F. Bresme, J. Chem. Phys. **124**, 104502 (2006).

14. "Torsional fluctuations in columnar DNA assemblies", D. J. Lee and A. Wynveen, J. Phys.: Condens. Matter **18**, 787 (2006).

13. "Direct observation of azimuthal correlations between DNA in hydrated aggregates", A. A. Kornyshev, D. J. Lee, S. Leikin, A. Wynveen, and S. Zimmerman, Phys. Rev. Lett. **95**, 148102 (2005).

12. "Phonon mediated helium atom transmission through superfluid helium four", K. A. Lidke, A. Wynveen, N. Baisch, C. Koay, C. F. Giese, and J. W. Halley, J. Low Temp. Phys. **140**, 429 (2005).

11. "Helium-vapor dynamics: Can BEC be produced in a moving frame without confinement?", J. W. Halley, Y. Lutyshyn, and A. Wynveen, Laser Phys. **15**, 636 (2005).

10. "Statistical mechanics of columnar DNA assemblies", A. Wynveen, D. J. Lee, and A. A. Kornyshev, Eur. Phys. Jour. E **16**, 303 (2005).

9. "DNA-DNA interaction beyond the ground state", D. J. Lee, A. Wynveen, and A. A. Kornyshev, Phys. Rev. E **70**, 051913 (2004).

8. "Nonlinear effects in the torsional adjustment of interacting DNA", A. A. Kornyshev and A. Wynveen, Phys. Rev. E **69**, 041905 (2004).

7. "Dynamics of low-energy helium vapor pulses", A. Wynveen, K. A. Lidke, M. C. Williams, C. F. Giese, and J. W. Halley, Phys. Rev. E **67**, 026311(2003).

6. "Multiscale Modeling of Many Body Systems", J. W. Halley, Y. Duan, K. Lidke, A. Wynveen, and M. Zhuang, in *Condensed Matter Theories* **25**, T. P. Das, editor (2002).

5. "Signatures of Bose-Einstein condensation in very low energy atomic scattering from trapped gases", A. Wynveen and J. W. Halley, Laser Physics **12**, No. 1, 223 (2002).

4. "Gas dynamics of pulsed low energy helium beams", K. A. Lidke, M. C. Williams, A. Wynveen, and J. W. Halley. J. Low Temp. Phys. **121**, 351 (2000).

3. "Identical particle scattering from a weakly coupled Bose-Einstein condensed gas", A. Wynveen, A. Setty, A. Howard, J. W. Halley, and C. E. Campbell, Phys. Rev. A **62**, 023602 (2000).

2. "Improved light soaking stability in r.f. sputter-deposited a-Si:H", A. Wynveen, J. Fan, J. Kakalios, and J. Shinar, M.R.S. Conf. Proc. **219**, 105 (1991).

1."Studies of light soaking stability in r.f. sputter-deposited a-Si:H", A. Wynveen, J. Fan, J. Kakalios, and J. Shinar, American Institute of Physics Conf. Proc., **234**, No. 1, 241 (1991).

TEACHING REFERENCES

Paul Crowell
Professor
School of Physics and Astronomy
University of Minnesota
116 Church St. SE
Minneapolis, MN 55455, USA
+1 (612) 624-4828
crowell@physics.umn.edu

Sean Albiston
Education Program Specialist
School of Physics and Astronomy
University of Minnesota
116 Church St. SE
Minneapolis, MN 55455, USA
+1 (612) 625-3598
sean@physics.umn.edu

Meenakshi Roy
Medical Student
University of Minnesota Medical School
420 Delaware Street SE
Minneapolis, MN 55455, USA
+1 (612) 532-9280
royxx178@umn.edu or mishyroy@gmail.com

James Kakalios
Professor
School of Physics and Astronomy
University of Minnesota
116 Church St. SE
Minneapolis, MN 55455, USA
+1 (612) 624-9856
kakalios@umn.edu

RESEARCH AND EMPLOYER REFERENCES

Ronald Poling
Department Head
School of Physics and Astronomy
University of Minnesota
116 Church St. SE
Minneapolis, MN 55455, USA
+1 (612) 624-7870
poling@umn.edu

Alexei A. Kornyshev
Dept. of Chemistry
Imperial College London
London SW7 2AZ, United Kingdom
+44 (0)20 7594 5786
a.kornyshev@imperial.ac.uk

Sergey Leikin
Section on Physical Biochemistry
NICHD
National Institutes of Health
Bethesda, MD 20892, USA
+1 (301) 594-8314
leikins@mail.nih.gov

Fernando Bresme
Dept. of Chemistry
Imperial College London
London SW7 2AZ, United Kingdom
+44 (0)20 7594 5886
f.bresme@imperial.ac.uk

Christos N. Likos
Faculty of Physics
University of Vienna
Boltzmanngaße 5
A-1090 Vienna, Austria
+43-1-4277-73230
christos.likos@univie.ac.at

J. Woods Halley
School of Physics and Astronomy
University of Minnesota
116 Church Street S.E.
Minneapolis, MN 55455, USA
+1 (612) 624-0395
woods@physics.umn.edu