CV, Professional Activities, Publications and Service
Phillip M. Duxbury

INDEX

Brief Vita

Education

1979 - 1983 Ph.D., Physics (1983), University of New South Wales, Sydney, Australia.
"Finite lattice methods in one and two dimensional quantum spin systems"
1973 - 1978 B.Sc. (Hons1A), (1979), Univ. of Western Aust., Perth, Australia

Professional experience

2013 - present Chairperson, Physics and Astronomy Department, MSU
2009 - 2013 Director, Center of Research Excellence in Complex Materials, MSU
2006 - 2009 Director, Center for Nanomaterials Design and Assembly, MSU
2002 - 2004 Associate Director, Center for Fundamental Materials Research, MSU
1998 - 2001 Director of Graduate Studies, Physics and Astronomy Department MSU
1997 - present Professor, Department of Physics and Astronomy, MSU
1994 - 1997 Associate Professor, Department of Physics and Astronomy, MSU
1993 - 1994 Sabbatical as Humboldt Fellow, HLRZ-KFA Juelich, Germany
1986 - 1992 Assistant Professor, Department of Physics and Astronomy, MSU
1986 - 1986 Postdoctoral Fellow, Department of Physics and Astronomy, Rutgers University, NJ
1984 - 1985 Postdoctoral Fellow, Department of Theoretical Physics, Oxford University, UK
1983 - 1983 Postdoctoral Fellow, Department of Physics, University of Southampton, England

Awards and fellowships

2008, 2011 CNS Distinguished Faculty Award
2006 - present Fellow of the American Physical Society, Division of Computational Physics
1993 - 1994 Alexander von Humboldt Fellowship, IFF-KFA, Germany
1984 - 1986 Junior Research Fellowship, Trinity College, Oxford, England
1979 - 1982 Commonwealth Postgraduate Scholarship, UNSW, Sydney, Australia

Leadership and Administrative roles

a. ***Director of Graduate Studies (1998-2001***)

The director manages all of the department functions regarding the graduate programs in physics and in astrophysics. This includes recruiting of graduate students, running of graduate courses, allocation of TAs to courses, budgeting for TAs and handling personal issues. With close to 60 faculty, over 150 graduate students and many staff involved in these programs, it was an interesting and challenging task. When I took on this task it was understood that research active faculty were expected to continue their research programs while carrying out the duties of the director effectively; and I was pleased to achieve those goals. As chair I also strive to enable department directors and associate chairs to continue and strengthen their research programs.

b. Director of Materials Research Centers, SPGs and faculty hiring (2006-2014)

During the early part of my research career I focused on my own research projects funded primarily by single investigator grants. In the early 2000s an experimental colleague in the PA department, Simon Billinge, convinced me to get engaged in a collaboration with him on determining the structure of non-crystalline or complex materials. This changed my view of what is important in science and in being successful in scientific research in the modern era. Since that time my research has become much more collaborative and I have developed very interesting and well supported projects with Simon and with other faculty at MSU, including Michael Mackay, Richard Lunt and Chong-Yu Ruan. I also have learned how to identify teams needed to build successful interdisciplinary projects. MSU is an excellent environment for team building; with few administrative barriers to cross-college collaborations. The university has supported the efforts that I have been involved in; both in terms of funding and in terms of allocation of faculty positions. Some of the university funded interdisciplinary research teams and programs that I have been involved in include:
Institute for Theoretical and Mathematical Physics – supported by the VPs office (2013-present)
Center of research excellence in complex materials – Supported by the VPs office (2009-present)
FRIB: Materials in extreme environments – Supported by an SPB (2012-2015)
Center for nanoparticle design and assembly – Supported by an SPG (2006-2009)
The university investments in these projects has paid off, with over $17M in group grants to the members of the complex materials center. Given the difficulty of the federal funding environment it is certainly important to keep faculty engaged with their colleagues in order to open up new research collaborations that may have good opportunities for federal funding. I am also currently leading an interdisciplinary training project funded by the US department of education; and I am co-PI on two other federally funded team projects; one focusing on accelerator physics and the other on ultrafast science.

The university initiative in complex materials lead to the formation of the Center of Research Excellence in Complex Materials (CORE-CM); and it provided 10 faculty positions in engineering, chemistry and physics. Two emerging leaders of MSU materials research, Richard Lunt and Tom Hamann, were hired as part of this effort. I served as director of CORE-CM during the period 2009-2014. The young leaders are now taking over leadership of CORE-CM and of hiring in interdisciplinary materials research. This is exciting to see as

encouraging leaders amongst the next generation is vital to the continuing vitality of any interdisciplinary effort. Two of my own research efforts; in ultrafast processes and in solar cells are well placed in among the interests of the CORE-CM cohort; and I plan to stay engaged in CORE-CM efforts to the extent that I can.

c. Chair of the Physics and Astronomy Department (2013-present)

I was appointed to this position in the middle of May 2013 and at first felt in very unfamiliar territory. As time has gone on, the job has become manageable and I find it very rewarding; though in some regards frustrating. I really enjoy facilitating the growth and success of faculty, staff and students who have the energy and motivation to get things done. Most of our department has this nature, which makes it a great place to work.

Though we are faced with continuing cuts to our budget, which is the frustrating part, I have been able to maintain our programs by working with faculty teams to develop strong hiring proposals to the GII program. This has resulted in cluster hires in two areas: Lattice quantum chromo-dynamics, joint with FRIB and CMSE and in Ultrafast Sciences, joint with Chemistry. In addition we received an opportunity position for a leader in experimental elementary particle physics, and we are in the process of building on that hire. We are also searching for a position in big data astronomy due to the continuing success of our astronomy and astrophysics programs. Since I became chair of the department we have hired eight young faculty (2 women) with tenure home in PA, another three that have tenure home in other units with partial appointment in PA (2 are women), and six that are appointed in the NSCL system with joint appointment in PA (no women). At the same time there has been considerable loss of faculty through retirement, one departure, and several faculty taking on roles in the higher university administration; so that overall our faculty FTE level is flat or slightly higher.

One very rewarding part of the job has been the international recognition that our young faculty have achieved; with the award of a Packard Fellowship to Jay Strader; a Sloan Fellowship to Kendall Mahn; a Cottrell Scholarship to Laura Chomiuk; DOE early career awards to Sean Couch, Chris Wrede and Heiko Heger; NSF early career awards to Huey-Wen Lin and Jaideep Singh. Overall the funding level and indirect return to the department is on an upward trend; as are the number of awards to our faculty. The overall ranking of the nuclear physics program remains at number one; and US news and world report gives our graduate program in physics a ranking of 26 in the US. Our rankings are expected to continue to improve due to the excellence of several of our programs; the outstanding level of our recent faculty hires; the development of FRIB science and growth of other new science initiatives including: particle astrophysics; big data astronomy; ultrafast science; physics education research; and accelerator physics.

The presence of NSCL/FRIB on our campus provides several interdisciplinary research avenues that have already achieved outstanding success. Early in my first term the NSF Physics Frontier Center was renewed and its center was moved to MSU. This is an outstanding achievement and is greatly assisted by strong collaborations between the NSCL/FRIB faculty and faculty in Astrophysics in the PA department. A second area of opportunity is accelerator physics. A collaboration in this area involving engineering and PA

has recently received a grant to establish MSU as a leading training program in this area. This should lead to a strong growth of further funding in this area. A second early challenge was to develop a formal process for NSCL faculty to apply for tenure through the CNS system. Negotiating this was challenging as there are very good arguments for and against having a process like this. However we came to an agreement and three of the NSCL faculty have succeeded in gaining tenure through CNS. There are many areas of potential research overlap with the NSCL/FRIB; including studies of the fundamental symmetries of nature; radiation effects in materials and areas related to the use of novel isotopes for detection. It is important to continue to look for opportunities to work synergistically with NSCL/FRIB.

The success of the physics education research (PER) group at MSU is perhaps the most spectacular, and to me, the most surprising. This group includes Danny Caballero; Vashti Sawtelle; Katie Hinko; and Paul Irving. They are all very well funded and have rapidly hired a large number of postdocs and students. They are now considered amongst the strongest groups in the country and internationally, which is remarkable as their most senior person, Danny Caballero, is being put forward for tenure this year. This group has also enabled us to move rapidly toward evidence based teaching practice; and the department is now in the process of developing and scaling up several new courses to better to serve our student populations.

The diversity of PA student populations is close to the norm in our area (20-25% female with a low population of minorities). Our faculty population is somewhat better than the national norm, with 9 out of 58 tenure stream faculty being women. We also have a strong student group, Women and Minorities in Physics (WaMPS), which we fund to provide mentoring for all students, but particularly women and minorities. They are also engaged in visiting high schools with a high minority population. Despite these successes we need to do more. We have very good connections with historically black colleges and universities (HBCUs) through Paul Gueye who has a collaboration with NSCL faculty. He is the past president of the society of black physicists and is currently chair of the leading HBCU Physics department (Hampton University). He is very engaged in introducing black students to MSU, in several areas of science and engineering, and he has developed a consortium of other HBCUs who are pooling their efforts in preparing students for bridge programs to graduate schools outside HBCUs. This is an important area for continued effort and I have been participating in several national conversations and programs focusing on diversity. Some of these workshops are listed below.

Recent workshops, conferences and panels related to leadership, diversity and STEM

Invited participant – AAU/Cottrell STEM workshop Laguna beach, May 2016
Steering Committee – APS/AAPT chairs conference, College Park, Maryland, June 2016
Participant in the annual Midwest physics and astronomy chairs meeting, Chicago Nov. (2013-2017)
Invited Participant in the NRAO-NAC diversity workshop, Washington DC, September 2017
Invited Participant in the AAAS SEA Change diversity workshop, Washington DC, October 2017

Current research projects and interests

The physics of ultrafast electron sources. In order to design ultrafast electron microscopes it is essential to have a high quality electron source. Chong-Yu Ruan (PA, MSU) and I have been working actively in this area for about 7 years. We have been funded by the NSF-MRI program, and we are now in the second of these grants. Each grant was over $950k. At present I have a postdoctoral fellow and a student working on this project. The theory part of the project is to study the ultrafast laser photoemission of high density ultrafast bunches of electrons from a surface, to extract them using an AC or DC extraction field, and to control the subsequent Coulomb expansion of the bunch. The goal is to use various EM elements; such as lenses, apertures or RF cavities; to produce a low emittance bunch with a controlled chirp for use in diffraction, microscopy or spectroscopy experiments. New DOE funding for a training program in accelerator science and engineering provides an opportunity for US students to work in this area. I just submitted an NSF theory proposal to fund extensions and further applications of our theoretical and computational work on this project.

Ultrafast quantum dynamics of electrons in solids. Ultrafast electron microscopy provides the capability to watch the non-equilibrium dynamics of solids in real time. I have one student working on the theoretical aspects of this project. A beautiful example of the physics of ultrafast non-equilibrium phase transitions studied in this way is the change in state induced by an ultrafast laser irradiation. This is an example of a photo-induced phase transition (PIPT) and these transitions are unlike phase transitions induced by heating or other close to equilibrium processes. The theory challenge is to dynamically treat the laser excitation of the electronic states and the way in which that energy is transferred to the other degrees of freedom in the system, such as lattice or spin degrees of freedom.

Physics of solar cells, such as organics and perovskites. I currently have a postdoc and a student working on this project. The postdoc is funded by research funds provided by CNS and the student is funded by the DE-GAANN program; and by an SPG on perovskite solar materials. We collaborate with Richard Lunt (CHEMS Dept. at MSU) in this area and are planning to submit a joint DOE proposal in early December on studies of new perovskite materials. The theory part of the project is to calculate the electronic structure of new perovskite materials and to study their stability on the substrates used by the experimentalists. We have a second project involved modeling the properties of solar devices and this work is being competed by the postdoc, who will leave at the end of the year.

Unassigned distance geometry. This is a project initiated through a collaboration with Simon Billinge who is jointly appointed at Columbia University and Brookhaven National Laboratory. It is closely related to the experimental challenge of finding the atomic structure of systems that are not crystalline. Though I do not have funding for this project, I continue to publish and give talks on the mathematical and computational foundations of the problem. I have been planning to write a proposal on this for some time but have been too busy with other things.

Two biophysics projects in limbo. The first project was on the effects of nanoparticles on health and brought together a team bringing field work (Jack Harkema); cell work (Norm Kaminski); a chemist to tune the size and surface properties of nanoparticles (Greg Baker); An engineer looking at the effect of nanoparticles on lipid membranes (Mark Worden); and a theorist (Me). We received a small grant front the NIH under the stimulus project, but it was for two years and soon ran out. At the same time Greg died suddenly leaving us without the key chemist making the nanoparticles. The second project was in collaboration with Carl Piermarocchi and a friend of his at the Burnham Institute. The objective is to develop algorithms to find optimal drug combinations, informed by high throughput screening experiments using cell line combinations (one normal and one cancerous). We received one joint grant for this and published a couple of papers, however I found that it is impossible to learn the biology I needed to know while learning how to be chair. Carlo has continued and is now PI of an NIH R01 in related areas.

RESEARCH PUBLICATIONS (Google Scholar : Duxbury PM**)**

a. Books and major reviews

1. Proceedings of conference on "*Dynamics of crystal surfaces and interfaces"*, P.M. Duxbury and T. Pence eds. (Plenum 1998).
2. Proceedings of Conference on "*Rigidity theory and applications"*, M.F. Thorpe and P.M. Duxbury eds. (Plenum 1999).
3. **"***Exact combinatorial algorithms: Ground states of disordered systems"*, M. Alava, P.M. Duxbury, C. Moukarzel and H. Rieger, in "Phase Transitions and Critical Phenomena", C. Domb and J. Lebowitz eds. Academic Press (2001).
4. **"***Elastic percolation networks"*, P.M. Duxbury in "Encyclopedia of complexity", Springer (2008).
5. M. Berz, P. Duxbury, K. Makino, and C.-Y. Ruan, editors, Femtosecond Electron Imaging and Spectroscopy; Proceedings of the Conference on Femtosecond Electron Imaging and Spectroscopy, FEIS 2013, December 9–12, 2013, Key West, Florida, *USA*, volume 191 of *Advances in Imaging and Electron Physics*. Elsevier (2015).

b. Refereed Publications in Journals

1. P.M. Duxbury, J. Oitmaa, M.N. Barber, A. van der Bilt, K.O. Young and R.L. Carlin. *Transverse Susceptibility of the one-dimensional Antiferromagnetic XY model. Application to Cs*2 *CoCl*4 . Phys. Rev. B24, 5149-5155 (1981).
2. M.N. Barber and P.M. Duxbury. *A Quantum Hamiltonian Approach to the two dimensional ANNNI model* J. Phys. A14, L251-255 (1981).
3. M. N. Barber and P. M. Duxbury *Hamiltonian Studies of the Two Dimensional Axial Next Nearest Neighbor Ising (ANNNI) Model. I. Perturbation Expansions* J. Stat. Phys. 29, 427-462 (1982).
4. P. M. Duxbury and M. N. Barber *Hamiltonian Studies of the Two Dimensional Axial Next Nearest Neighbor Ising (ANNNI) Model. II. Finite Lattice Mass Gap Calculations* J. Phys. A15, 3219-3233 (1982).
5. P. M. Duxbury and J. Oitmaa *A Finite Lattice Study of the Spin 1 Heisenberg Model with Biquadratic Exchange* J. Phys. C16, 4199-4207 (1983).
6. P. M. Duxbury and W. Selke *Branching Processes in the ANNNI Model* J. Phys. A16, L741-744 (1983).
7. P. M. Duxbury, J. Yeomans and P. D. Beale *Wavevector Scaling and the Phase Diagram of the Two Dimensional Chiral Clock Model* J. Phys. A17, L179-184 (1984)
8. A. L. Stella, S.L.A. de Queiroz, P. M. Duxbury and R. B. Stinchcombe *Series Study of the One Dimensional "True" Self-Avoiding Walk* J. Phys. A17, 1903-1912 (1984).
9. P. M. Duxbury, S.L.A. de Queiroz and R. B. Stinchcombe *A Comparative Study of Interacting Random Walk Models* J. Phys. A17, 2113-2118 (1984).
10. W. Selke and P. M. Duxbury *The Mean-Field Theory of the Three Dimensional ANNNI Model.* Z. Phys.B57, 49-58 (1984).
11. P. M. Duxbury and S.L.A. de Queiroz *A Unifying Model of Generalized Random Walks* J. Phys. A18, 661-670 (1985).
12. P. L. Leath and P. M. Duxbury *Combinatorial Formulae for One-Dimensional Generalized Random Walks* J. Phys. A18, 1435-1447 (1985).
13. P. D. Beale, P. M. Duxbury and J. Yeomans *Finite Size Scaling of Two Dimensional ANNNI Models* Phys. Rev. B31, 7166-7170 (1985).
14. P. M. Duxbury and J. Yeomans *Low Temperature Series Analysis of Multilayer Adsorption at Ising Surfaces* J. Phys. A18, L983-988 (1985).
15. D. B. Abraham and P. M. Duxbury *Necklace Solid on Solid Models of Interfaces and Surfaces* J. Phys. A19, 385-393 (1986).
16. K. Armistead, J. Yeomans and P. M. Duxbury *Layering Transitions at an Interface* J. Phys A19, 3165-3184 (1986).
17. R. B. Stinchcombe, P. M. Duxbury and P. Shukla *The Minimum Gap on Diluted Cayley Trees* J. Phys. A19, 3903-3916 (1986).
18. P. M. Duxbury, P. D. Beale and P. L Leath *Size Effects of Electrical Breakdown in Quenched Random Media,* Phys. Rev. Lett. 57, 1052-1055 (1986).

19. P. M. Duxbury and P. L. Leath *The Failure Distribution in Percolation Models of Breakdown* J Phys. A20, L411-415 (1987).
20. P. M. Duxbury, P. L. Leath and P. D. Beale *The Breakdown Properties of Quenched Random Systems - TheRandom Fuse Network* Phys. Rev. B36, 367-380 (1987).
21. Y. S. Li and P. M. Duxbury *The Size and Location of the Largest Current in a Random Resistor Network* Phys. Rev. B36, 5411-5419 (1987).
22. P. D. Beale and P. M. Duxbury *Dielectric Breakdown in Metal Loaded Dielectrics* Phys. Rev. B37, 2785-2791 (1988).
23. Y. S. Li, P. M. Duxbury and A. C. Orrick *The Current Dependent Resistance of Dilute Switching Networks*. Phys. Rev. B37, 5629-5632 (1988)
24. Y.S. Li and P.M. Duxbury, *Crack Arrest by Residual Bonding in Resistor and Spring Networks.* Phys. Rev. B38, 9257-9260 (1988)
25. J.M. Yeomans, M.R. Smith and P.M. Duxbury, *Interface Layering in Novel Geometries.* J. Phys. A21, L1107-1112 (1988)
26. P.M. Duxbury and A.C. Orrick, *Solvable Models of Corner Wetting in Two and Three Dimensions.* Phys. Rev. B39, 2944-2947 (1989)
27. Y.S. Li and P.M. Duxbury, *From Moduli Scaling to Breakdown Scaling - A Moment Spectrum Analysis* Phys. Rev. B40, 4889-4897 (1989)
28. P.M. Duxbury, *Breakdown of Diluted and Hierarchical systems* Chap. 6 (pp189-228) of *Statistical Models for the Fracture of Disordered Media* H.J. Herrmann and S. Roux eds. North Holland (NY, 1990)
29. P.M. Duxbury, P.D. Beale, H. Bak and P.A. Schroeder *Capacitance and Dielectric Breakdown of Metal Loaded Dielectrics.* J. Phys. D23, 1546-1553 (1990)
30. S.G. Kim and P.M. Duxbury, *Cracks and Critical Current*, J. Appl. Phys. 70, 3164-3170 (1991).
31. X. Yu, P.M. Duxbury, G. Jeffers and M.A. Dubson, *Coalescence and Percolation in Thin Metal Films*, Phys. Rev. B44, 13163-13166 (1991).
32. P.M. Duxbury, *Disorder brings order to fracture theory*, Physics World, June issue, 27-28 (1992)
33. P.M. Duxbury, S.G. Kim and P.L. Leath, *Size effect and statistics of fracture in random materials*, Mat. Sci. and Eng. A176, 25 (1994)
34. G. Jeffers, M.A. Dubson and P.M. Duxbu 75, 5016 (*The island to percolation transition during growth of thin films*, J. Appl. Phys. 75, 5016 (1994)
35. P.M. Duxbury, M.A. Dubson, X. Yu and G. Jeffers, *Substrate Inhomogeneity and the growth morphology of thin films*, Europhys. letts. 26, 601 (1994)
36. P.L. Leath and P.M. Duxbury, *Exact solution to an interacting extreme value problem-The pure flaw model*, NIST. J. Res. 99, 1 (1994)
37. P.M. Duxbury and P.L. Leath, *Exactly solvable models of material breakdown*, Phys. Rev. B49, 12676 (1994)
38. W. Selke and P.M. Duxbury, *Surface profile evolution above roughening*, Z. Phys. B94, 311 (1994)
39. P.L. Leath and P.M. Duxbury, *Fracture of heterogeneous materials with continuous distributions of local break- ing strengths*, Phys. Rev. B49, 14905 (1994)
40. P.M. Duxbury and P.L. Leath, *The failure probability and average strength of disordered systems*, Phys. Rev. Lett. 72, 2805 (1994)
41. W. Selke and P.M. Duxbury, *Surface profile evolution above and below the roughening transition*, Acta. Physica Slovaca 44, 215 (1994).
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45. X. Yu and P.M. Duxbury, *Kinetics of non-equilibrium shape change in gold clusters*, Phys. Rev. B52, 2102 (1995).
46. W. Selke and P.M. Duxbury, *Equilibration of crystal surfaces*, Phys. Rev. B52, 17468 (1995).
47. C. Moukarzel and P.M. Duxbury, *Stressed backbone and elasticity of random central-force systems*, Phys. Rev. Lett. 75, 4055 (1995).
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50. C. Moukarzel, P.M. Duxbury and P.L. Leath, *Infinite-cluster geometry in central-force networks*, Phys. Rev. Lett. 78, 1480 (1997)
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54. P.M. Duxbury, D. Jacobs, M.F. Thorpe and C. Moukarzel, *Floppy modes and the free energy: Rigidity and connectivity percolation on Bethe lattices*, Phys Rev. E59, 2084 (1999).
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59. B. Blagojevic and P.M. Duxbury, *Atomic diffusion, step relaxation and step fluctuations*, Phys. Rev. E60, 1279 (1999).
60. E. Seppala , M.J. Alava and P.M. Duxbury, *A periodic elastic medium in which periodicity is relevant*, Phys. Rev. E62, 3230 (2000)
61. E. Seppala, M.J. Alava and P.M. Duxbury, *Intermittence and roughening of periodic elastic media*, Phys. Rev. E63, 035126 (2001)
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63. P.M. Duxbury and J. Meinke, *Ground state non-universality in the random field Ising model*, Phys. Rev. 64, 036112 (2001).
64. R. Dobrin and P.M. Duxbury, *Minimum spanning trees on random networks* Phys. Rev. Lett. 86, 5076 (2001).
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72. P.M. Duxbury and E.S. McGarrity, *Critical manifolds in non-linear response of complex materials*, Mechanics of materials 38, 757-771 (2006).
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76. E.A. Holm and P.M. Duxbury, *Three dimensional material science*, Scripta Materialia 54, 1035 (2006)
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82. R.S. Krishnan, M.E. Mackay, P.M. Duxbury, C.J. Hawker, S. Asokan, M.S. Wong, R. Goyette, P. Thiyagarajan, *Improved polymer thin-film wetting behavior through nanoparticle segregation to interfaces*, J. Phys. Con- dens. Matter. 19, 356003 (2007).
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84. A. Tuteja, P.M. Duxbury and M.E. Mackay, *Polymer chain swelling induced by dispersed nanoparticles*, Physical Review Letters 100, article number 77801 (2008).
85. E.S. McGarrity, P.M. Duxbury, M.E. Mackay and A.L. Frischknecht, *Calculation of entropic terms governing nanoparticle self-assembly in polymer films*, Macromolecules 41, 5952-5954 (2008).
86. P. Juhas, L. Granlund, P.M. Duxbury, W.F. Punch and S.J.L. Billinge, *The LIGA algorithm for ab initio determination of nanostructure*, Acta Crystallographica A64, 631-640 (2008).
87. M.A. Yaklin, P.M. Duxbury and M.E. Mackay, *Control of nanoparticle dispersion in thin polymer films*, Soft Matter 4, 2441-2447 (2008).
88. J.W. Liu, M.E. Mackay and P.M. Duxbury, *Nanoparticle formation by crosslinking a macromolecule*, Euro- physics Letters 84, article number 46001 (2008).
89. J. W. Liu, M. E. Mackay and P. M. Duxbury, *Molecular Dynamics Simulation of Intramolecular Cross-Linking of BCB/Styrene Copolymers*, Macromolecules 42, 85348542 (2009)
90. P. M. Duxbury, *Exact computations test stochastic Loewner evolution and scaling in glassy systems*, J. Stat. Mech. N09001 (2009).
91. J.D. Feala, J. Cortes, P.M. Duxbury, C. Piermarocchi, A.D. McCulloch and G. Paternostro, *Systems ap- proaches and algorithms for discovery of combinatorial therapies*, Wiley Interdisciplinary Reviews: Systems Biol- ogy and Medicine Volume 2 Issue 2, Pages 181 - 193 (2010).
92. P. Juhas, L. Granlund, R. Gujarathi, P.M. Duxbury and S.J.L. Billinge, *Crystal structure solution from experimentally determined pair distribution functions*, J. Appl. Crystal. 43, 623-629 (2010)
93. T.C. Cheng, E.S. McGarrity, J.W. Kiel, P.M. Duxbury, M.E. Mackay, A.L. Frischknecht, S. Asokan and M.S. Wong, *Three dimensional liquid surfaces through nanoparticle self-assembly*, Soft Matter (6), 1533-1538 (2010)
94. Zhensheng Tao, He Zhang, Phillip M. Duxbury, Martin Berz and Chong-yu Ruan, *Space-charge effects in ultrafast electron diffraction and imaging*, J. Appl. Phys. 111, 044316 (2012).
95. Jacob D. Feala, Jorge Cortes, Phillip M. Duxbury, Andrew D. McCulloch, Carlo Piermarocchi, Giovanni Paternostro, *Statistical Properties and Robustneess of Biological Controller-Target Networks* PLoS One 7, e29374 (2012).
96. Z.S. Tao, T.R.T. Han, S.D. Mahanti, P.M. Duxbury, F. Yuan, C.Y. Ruan, K. Wang, J.Q. Wu, *"Decoupling of structural and electronic phase transitions in VO_2"* Phys. Rev. Lett. 109 (166406), pages 1-5 (2012).
97. D.P. Olds, P.M. Duxbury, J.W. Kiel and M.E. Mackay, *"Percolating bulk heterostructures from neutron reflectometry and small-angle scattering data",* Phys. Rev. E86, 61803, pages 1-5 (2012).
98. J. Portman, H. Zhang, Z. Tao, K. Makino, M. Berz, P.M. Duxbury and C.Y. Ruan, *Computational and experimental characterization of high-brightness beams for femtosecond electron imaging and spectroscopy*, Appl. Phys. Lett. 103, 253115 (2013).
99. C. Jiang, R. R. Lunt, P. M. Duxbury, and P. P. Zhang, "*High-Performance Inverted Solar Cells with a Controlled ZnO Buffer Layer*", RSC Advances 4, 3604 (2014).
100. J. Sun, K. Pimcharoen, S. R. Wagner, P. M. Duxbury, and P. P. Zhang, "*Nanoscale Imaging of Dense Fiber Morphology and Local Electrical Response in Conductive Regioregular Poly(3-hexylthiophene)*", Org. Electron. 15, 441 (2014).

101. D.P. Olds and P.M. Duxbury, *Efficient algorithms for calculating small-angle scattering from large model structures*, J. Appl. Crystal. 47, 1077-1086 (2014).

102. C.-Y. Ruan, P.M. Duxbury, M. Berz, *Perspectives on femtosecond imaging and spectroscopy of complex materials using electrons*. Z. Liu, I. C. Khoo, Eds., Ultrafast Nonlinear Imaging and Spectroscopy II, Proc. of SPIE, vol. 9198 (2014).

103. S.R. Gujarathi, C.L. Farrow, C. Glosser, L. Granlund and P.M. Duxbury. *Ab-initio reconstruction of complex Euclidean networks in two dimensions.* Phy. Rev. E89, number 53311, (2014).

104. C. Jiang, R. R. Lunt, P. M. Duxbury, and P. P. Zhang. *High-Performance Inverted Solar Cells with a Controlled ZnO Buffer Layer.* RSC Advances 4, 3604 (2014).

105. J. Sun, K. Pimcharoen, S. R. Wagner, P. M. Duxbury, and P. P. Zhang. *Nanoscale Imaging of Dense Fiber Morphology and Local Electrical Response in Conductive Regioregular Poly(3-hexylthiophene)*. Org. Electron. 15, 441 (2014).

106. J. Portman, H. Zhang, K. Makino, C.-Y. Ruan, M. Berz, and P.M. Duxbury. *Untangling the contributions of image charge and laser profile for optimal photoemission of high-brightness electron beams.* Journal of Applied Physics 116, #174309 (2014).

107. L. Granlund, S.J.L. Billinge and P.M. Duxbury. *Algorithm for systematic peak extraction from atomic pair distribution functions.* Acta. Crystal. A71, 392-409 (2015).

108. T.T. Han, F. Zhou, C.D. Malliakas, P.M. Duxbury, S.D. Mahanti, M.G. Kanatzidis, C.-Y. Ruan. *Exploration of meta-stability and hidden phases in correlated electron crystals visualized by femtosecond optical doping and electron crystallography*. Science Advances 1, #5 e1400173 (2015).

109. H. Zhang, J. Portman, Z. Tao, P.M. Duxbury, C.-Y. Ruan, K. Makino, and M. Berz. *The differential algebra based multiple level fast multipole algorithm for 3d space charge field calculation and photoemission simulation. Microscopy and Microanalysis*, 21 (supplement 4), 224-229 (2015).

110. J. Portman, H. Zhang, K. Makino, C.-Y. Ruan, M. Berz and P.M. Duxbury Multiscale modeling of the ultrafast electron microscope: From the photocathode to the sample in *Advances in Imaging and Electron Physics* volume 191, 117-130 (2015).

111. P.M. Duxbury, L. Granlund, S.R. Gujarathi, P. Juhas, S.J.L. Billinge. *The unassigned distance geometry problem*. Discrete Applied Mathematics 204, 117-132 (2016).

112. S.J.L. Billinge, P.M. Duxbury, D.S. Goncalves, C. Lavor, A. Mucherino. *Assigned and unassigned distance geometry: Applications to biological molecules and nanostructures*. 4OR – Quarterly Journal of Operations Research 14 (4), 337-376 (2016).

113. P.M. Duxbury. *Simple graphs to guide combinatorial materials design.* Acta Crystall. A72, 265 (2016).

114. P.M. Duxbury and S.J.L.Billinge. *Graph rigidity, unassigned distance geometry and the nanostructure problem*, Proceedings of the 50th Asilomar Conference on Signals, System and Computers, 1483-1487 (2016).

115. B. Hwang and P.M. Duxbury, *Optimizing laser pulses to control photoinduced states of matter*, Phys. Rev. A94(4), 043404 (2016).

116. J. Williams, F. Zhou, T. Sun, Z. Tao, K. Chang, K. Makino, M. Berz, P.M. Duxbury, and C.-Y. Ruan, *Active control of bright electron beams for femtosecond diffraction and spectroscopy.* Submitted to Structural Dynamics 4, 44035 (2017).

117. Lili Wang, Pei Chen, Non Thongprong, Margaret Young, Padmanaban S. Kuttipillai, Kai Sun, Phillip M. Duxbury, Richard R. Lunt, *Unlocking the Single Domain Epitaxy of Halide Perovskites*. Advanced Materials Interfaces 1701003, (2017).

c. Refereed and/or invited Conference Proceedings

1. P.M. Duxbury and Y.S. Li *Scaling Theory and Fluctuations of the Strength of Composites*, 115-148 of *Random*
2. *Media and Composites*, R.V. Kohn and G.W. Milton eds. SIAM (Philadelphia, 1989)

3. P.M. Duxbury and Y.S. Li, *Scaling Theory and Fluctuations of the Strength of Percolation Networks.* in *Disorder and Fracture*, E. Guyon and S. Roux eds., pp141-147, NATO, ASI series 1990.
4. P.M. Duxbury and S.G. Kim, *Scaling Theory and Simulations of Fracture in Disordered Media* P.M. Duxbury and S.G. Kim Proceedings of the ASME symposium on *Damage Mechanics* Dallas, Texas Nov, 1990
5. P.M. Duxbury and S.G. Kim, *Scaling Theory of Elasticity and Fracture in Disordered Networks* MRS Symp. Proc. **207**, 179-195 (1991).
6. P.M. Duxbury, *Disorder and Scaling in regular and hierarchical composites*, Proc. MRS 1992.
7. S.K. Chan, S.G. Kim and P.M. Duxbury, *Elasticity and fracture of tubular honeycombes containing random vacancies*, Proceedings of CASME II (North Holland, 1992).
8. C.D. Nelson, W.P. Pratt JR., S.G. Kim and P.M. Duxbury, *Cracks and supercurrent flow in thin films*, Proceed- ings of 7th International Conference on Flux Pinning and Critical Currents, H.W. Weber ed. World Scientific (New Jersey, 1994).
9. P.L. Leath and P.M. Duxbury, *Analytically solvable models of material breakdown*, Proceedings of the India- France conference on Soft Condensed Matter (Springer, 1995).
10. P.M. Duxbury and P.L. Leath, *Modelling of materials with random microstuctures* in "Simulation of materials processing: Theory, Methods and Applications", eds S. Shen and P. Dawsen, (Balkema, 1995).
11. P.M. Duxbury, E. Rzepniewski and C. Moukarzel, *Structure-sensitive properties of materials*, in "Proceed- ings of the IUTAM on non-linear analysis of fracture", (Klewer, 1995).
12. B. Blagojevic and P.M. Duxbury, *From atomic diffusion to step dynamics*, in Proceedings of "Dynamics of crystal surfaces and interfaces", P.M. Duxbury and T. Pence eds. (Plenum 1998).
13. C. Moukarzel and P.M. Duxbury Comparison of connectivity and rigidity percolation In proceedings "Rigidity theory and applications" M.F. Thorpe and P.M. Duxbury eds., Plenum (1999).
14. P.M. Duxbury, R. Dobrin, E. McGarrity, J.H. Meinke, A. Donev, C. Musolff and E.A. Holm, *Network algorithms and critical manifolds in disordered systems*, in "Computer simulation studies in condensed matter physics", Volume XVII, David Landau ed. (Springer, 2003).

d. Invited Conference Lectures

1. Univ. of California Conf. on Stat. Mech, Davis CA, March 1986. Lecture entitled *A unifying model of generalised random walks*.
2. 15th Midwest Sol. State. Theory Sym., Kent State Univ. Ohio, Oct. 1987. Lecture entitled *The Statistical Mechanics of Electrical and Mechanical Breakdown*.
3. APS March Meeting, New Orleans Louisiana, March 1988. Lecture entitled *Scaling Theories of Breakdown in Random Media*.
4. IBM/MSU workshop, MSU Nov. 1988. Lecture Entitled *Novel method for Predicting Moduli and Strength of Random Composites*.
5. SIAM workshop on "Random Media and Composites", Leesburg VA, Dec. 1988. Lecture entitled *Strength Scaling and Fluctuations in random composites*.
6. NATO Advanced Study Institute on "Disorder and Fracture", Cargese, Corsica, May/June 1989. Lecture entitled *Statistical Mechanics of Breakdown*.
7. DOE conf. on "Interpenetrating Phase Composites", Snowmass, Colorado, July 1989. Lecture title *Scaling Relations for Composites*.
8. NIST/ONR workshop on "Fracture Computations", Gaithersburg MD, Sept. 1989. Lecture Entitled *Statistical Mechanics Applied to Breakdown Phenomena*.
9. Dielectrics Society of Great Britain Annual Conference Canterbury UK, April 1990. Lecture entitled *Capacitance and Dielectric Breakdown of Metal Loaded Dielectrics*
10. Cornell Mathematical Sciences Institute workshop on "Percolation Models of Material Failure" June 1990, Lecture title *The Statistics of Disordered Systems: Extreme Statistics Versus the Normal Law*
11. MRS Fall 1990 Meeting in Boston, Nov 1990 In symposium on "Scaling in Disordered Systems" Lecture entitled *Scaling theory for elasticity and strength of disordered material*.

12. ASME winter meeting in Dallas, Nov. 1990 In Symposium on "Damage Mechanics". Lecture entitled *Scaling Theory and Simulations of Fracture in Disordered Media*
13. DARPA Workshop on "Mechanical Properties of Thin Films", San Diego, July 1991. Lecture entitled *Role of Defects in Super- conducting Thin Film.*
14. MRS Fall 1991 Meeting in Boston, Dec. 1991. In symposium entitled "Heirarchically structured materials". Lecture entitled *Disorder and Scaling Relationships in Composite*s.
15. Midwest Thermo. conf., Waldan Woods MI, April 1992. Lecture entitled *Coalescence and percolation during non-equilibrium growth.*
16. AFOSR workshop "Problems involving mechanics and physics", Chicago, July 1992. Lecture entitled *Fracture of disordered systems*
17. CASME 2nd international conference, Sept. 1992, Yokohama, Japan. Lecture entitled *Elasticity and fracture at the atomic level*.
18. APS March meeting 1993, Seattle Washington. Lecture entitled *Novel methods for calculating the effective properties of polycrystalline and composite materials*
19. 3rd International conference on fracture, Urabandai national park, Japan, May 1993. Lecture entitled *Fracture of disordered materials*.
20. 3rd conference on "Computational approaches to materials research", Morgantown WV, May 1993. Lecture entitled *The effective properties of random materials*
21. APS physics and computing meeting, Alberquque New Mexico, June 1993, Lecture entitled *Scaling problems in materials simulations*
22. NSF institute for mechanics and materials workshop on "Bridging the length scale gap", San Diego California, Sept. 1993. Lecture entitled *Variability in interface properties-a key factor in bridging the length scale gap*.
23. IBM/ONR workshop on "Microstructure formation and evolution in thin films". Ossining, New York State, October 1993. Lecture entitled *Statistical aspects of instabilities*.
24. MRS spring meeting in San Francisco, April 1994. Lecture entitled *Crack nucleation and fracture of hetero- geneous materials*
25. MRS Fall meeting, Boston, Dec. 1994. Lecture Entitled *Scaling laws and simulations of breakdown phenomena*
26. Princeton materials science workshop on computational models of materials, May 1995. Lecture enti- tled *Models for structure-sensitive properties of materials*
27. Rutgers (Lebowitz) statistical physics conference, May 1995. Lecture entitled *Step repulsion, step annihi- lation and profile decay*.
28. 8th international symposium on " Continuum models and discrete systems", Varna Bulgaria June 11-16th 1995. Lecture entitled *Modelling structure-sensitive properties of materials*.
29. IUTAM conference on " Non-linear analysis of fracture", Cambridge UK, Sept. 1995. Lecture entitled *Structure-sensitive properties of materials*.
30. ACERS fall 1995 meeting, Nov. 5th-8th New Orleans. Lecture entitled *Simple estimates and simulations of the strength of composites*.
31. MRS fall 1995 meeting, Nov. 26th-1st Dec, Boston. Lecture entitled *Scaling laws in fracture - when is a notch test misleading*.
32. *Toughness of disordered networks* presented at the MATRA conference on "Topologically disordered materials", Jyva¨ skyla Finland, Feb. 1997.
33. *Dynamics of interacting strings* presented at the Lebowitz Stat. Mech conference, Rutgers, May. 1997.
34. *Interfaces in random materials* presented at the Argonne conference on "Interfacial Materials", Summer 1997
35. *Force percolation networks*, Gordon conference on "Fractals", Il Cioco Italy, May 1998.
36. *Optimisation methods in interface and membrane problems*, MATRA conference on "Random materials", Finland, June 1998

37. *Comparison of connectivity and rigidity percolation*, Traverse City Conference on "Rigidity Theory and Applications", June 1998.
38. *Annealing of nanostructures*, at the "International conference on crystal growth (ICCG) West", Stanford Sierra Camp, Tahoe, June 1998
39. *Optimisation methods in disordered systems*, "International Conference on Computational Physics (ICCP98)", Granada (Spain), Sept. 1998
40. *Instabilities in disordered solids*, "International Conference on Statistical Physics", Calcutta, India, 4-9 Jan. (1999).
41. *Graph algorithms applied to materials' analysis*, SIAM meeting (minisymposium), 12-15 May. (1999).
42. *Roughness and toughness of quasistatic fractures*, at Society of Engineering Science Annual meeting (SES99), U. Texas, Austin, October 1999.
43. *Optimisation methods applied to materials analysis*, at the conference on "Materials Design: Experimental and Computational Challenges", Lousiana State Univ. March 2-4 2000.
44. *Algorithms for physics and the physics in algorithms*, at the European Physical Society Meeting, Montreux, Switzerland, March 13-17 2000.
45. *Are random systems universal?*, At the Schloss Dagstuhl Workshop on Algorithms in physics, Feb. 26- March 2 (2001).
46. *Scaling laws for random combinatorial problems*, Sante Fe Workshop on Statistical physics and computational complexity, September 2001.
47. *Diffusion through platelet reinforced composites* DOE-CMSN workshop on polymer interfaces, Sandia Labs., September 2001.
48. *Network algorithms and critical manifolds in disordered systems*, Center for simulational physics 2003 work- shop, Athens Georgia Feb. 2003.
49. *Fast iterative algorithms for hard problems*, Schloss Dagstuhl (Germany) seminar on "Algorithms in physics", Sept. 2003.
50. *Co-operative geometric indicators of materials performance*, In the Prager prize symposium, SES meeting Lincoln, Nebraska October (2004).
51. *Algorithms for complex systems: Lattices gases and rigidity*, At the workshop on *Structure of nanocrystals*, Tempe Arizona, December (2004).
52. *Scaling laws in grain boundary engineering*, for the symposium on *Scaling laws in fracture* at ICF11, Turin Italy, March 2005.
53. *Magnetic field induced magnetic phase separation: Domain states*, at Telluride meeting on Competing inter- actions and colossal responses in transition metal compounds, Telluride Colorado, July 2006.
54. *Critical defect networks in polycrystalline materials and in nanomaterials*, at World Congress on Computational Mechanics, Los Angeles California, July 2006.
55. *Physics perspective on systems biology*, at AAPT conference, Syracuse NY, July 2006.
56. *Failure of complex materials: Nanotubes and polycrystalline materials* at Multiscale materials modelling conference, Freiburg Germany, September 2006.
57. *Modelling life or death decisions in the apoptosis network* QBMI workshop, Mackinaw Island Michigan, September 2006.
58. *Combinatorial optimization and statistical physics* at SIAM workshop on Combinatorial Scientific Computing, Costa Mesa California, Feb. 2007.
59. *Simulation of nanoparticle formation by irreversible collapse of unfolded macromolecular precursors*, ACS Chicago, April 2007.
60. *Nanoparticle self-assembly in polymer melts* ModeCom meeting, Bath UK May 2007.
61. *Role of microstructural inhomogeneities in rupture of polycrystalline materials*, APS March Meeting, New Orleans 2008.
62. *Strategies for nanostructure determination and refinement*, Beyond crystallography: Structure of

nanostructured materials, Tempe Arizona, May 17-20 (2008).

63. *Characterization and control of nanoparticle structure dispersion and self-assembly*, AVS dinner meeting, Detroit September 2008.
64. *Characterization and control of nanoparticle structure dispersion and self-assembly*, MCIAM after dinner talk, MSU October 2008.
65. *Entropy, self-assembly and density fluctuations in polymers containing nanoparticles*, Workshop on Fluctuations in Material Properties, Courmayeur Italy, January 27-29 2010.
66. *Relations between physics and combinatorial optimization problems*, QANSAS2010, DEI Agra India, December 2-5 2010.
67. *Multiscale simulation of solar cell morphologies guided by SANS and neutron reflectivity data*, March APS meeting, Dallas, 21-25 March 2011.
68. *Modeling to improve self-assembly, characterization and structure-property relations of nanoparticle-organic hybrid materials*. Winter School on *Organic* Electronic *Materials* & Devices (OEMD-*2013*); NITK Mangalore, India
69. "The unassigned distance geometry problem" *20th IFORS Conference: The Art of Modeling*. Barcelona 13th-18th July 2014.
70. "Computational geometry, combinatorial optimization and nanostructure determination"
71. Conference on *Many faces of Distances*, Campinas Brazil, Oct. 22-24 2014.
72. "The unassigned distance geometry problem" *INFORMS Annual meeting: Bridging Data and Decisions*, San Francisco Nov. 9-12 2014.
73. "Photoemission and beam physics of space-charge dominated electron bunches" *FEIS-2: Second In.l conference on "Femtosecond Electron Imaging and Spectroscopy"*, Lansing MI, May 6-9 2015.
74. "Ultrafast photo-induced phase transitions in the solid state", In the workshop *on Zero-field spin effects in molecular systems*", Telluride June 23-27 2015.
75. "Graph rigidity, unassigned distance geometry and the nanostructure problem", *At the 50th Asilomar Conference* on Signals, System and Computers, Nov. 6-9 2016, Pacific Grove CA.
76. N-particle and PIC simulations of dense electron bunch dynamics: High emittance rings and the dynamics of crossover. At the third international conference on femtosecond electron imaging and *spectroscopy (FEIS-3),* June 11-16, 2017, Shanghai, China.

e. Seminars and colloquia

1. Materials Science Group, IBM Yorktown Heights, Mar 1989
2. Dept. of Math. and Statistics, MSU, Oct. 1989
3. Inst. for Mat. Science, McMaster Univ., Ontario Canada, Oct. 1989
4. Materials Science Group, NIST, Nov. 1989
5. Dept. of Theo. Phys., Oxford, April 1990.
6. CFMR symposium, Thrust Area co-ordinator summary, May 1990.
7. Physics Dept. Western Mich. Univ., Kalamazoo, Oct. 1990.
8. Dow Chemical Company, Midland Mich, Oct. 1990
9. Physics Dept., MSU, Nov. 1990 (Brown Bag).
10. CFMR industrial affiliates day, MSU, Feb. 1991.
11. Physics Dept., Univ of Evansville, Evansville Ill., Apr. 1991
12. Physics Dept., Res. Sch. of Phys. Sci., Aust. Nat. Univ., July 1991.
13. Dept. of Appl. Math., Melbourne Univ., July 1991.
14. Div. of Geosciences, CSIRO Melbourne, July 1991.
15. Dept. of Earth Sciences, Monash Univ. Melbourne, July 1991.
16. UM/MSU workshop, Physics Dept., MSU, April 1992.
17. Dept. of Physics, MSU, Feb. 1992.
18. Dept. of Physics, Univ. of Maryland, April 1992
19. HLRZ, KFA Julich, June 1992
20. Applied Physics, Univ. of Groningen, June 1992
21. Engineering school, Tamagawa Univ., Japan, Sept. 1992

22. ITP Santa Barbara, California, Nov. 1992
23. Biosym Technologies, San Diego Nov. 1992
24. DOE workshop Washington DC May 1993
25. HLRZ-KFA Ju¨ lich, Germany, October 1993
26. Dept. of Theoretical Physics, Oxford Univ. England Nov. 1993
27. Raychem Technologies, Palo Alto California April 1994.
28. Ecole Superieure de Physique et Chimie Ind., Paris April 1994.
29. TFT-Univ. of Helsinki, Finland May 1994.
30. IGV KFA Juelich, Germany May 1994.
31. Dept. of Physics, Univ. of Western Aus., Aug. 1994.
32. Campus theory seminar, Michigan State Univ, Sept. 1994
33. Applied Math. Dept. Seminar, Michigan State Univ., Oct. 1994.
34. Condensed Matter Physics Seminar, Michigan State Univ., Oct. 1994.
35. Dept. of Physics, Univ. of Nebraska, April 1995.
36. HLRZ, Forschungszentrum Juelich, May 1995.
37. Dept. of Physics, Rutgers, May 1995.
38. Dept. of Theoretical and Applied Mechanics, Cornell, Oct. 1995.
39. Dept. of Physics, Univ. of Michigan, Oct. 1996.
40. Dept. of Physics Colloquium, MSU, Jan. 1997.
41. Complex systems group, Univ. of Mich. Feb. 1997.
42. Physics Dept., Technische Hochschule, Aachen, Feb. 1997.
43. Condensed Matter Theory group, Ohio State Univ., April 1997.
44. Surface Physics Group Seminar, Rutgers Univ., May 1997.
45. High performance computing group, Sandia Labs., July 1997.
46. Physics Department Seminar, Univ. Notre Dame, Oct. 1997.
47. Part of "Nanocomposites" presentation, Ford Research, April 1998.
48. Physics Dept., Univ. of Toledo, Oct. 1998
49. Physics Dept., Sandia Laboratories, Feb. 1999.
50. Polymers Workshop, Sandia Labs., April 1999.
51. Campus theory seminar, MSU, Feb. 2000.
52. Physics Department, HUT Finland, May 2001.
53. Physics Department CMP seminar, MSU, Sept. 2001.
54. Ford-MSU nanocomposites group meeting, MSU, Oct. 2001.
55. Joint CMP/Rutcor seminar, Rutgers, Nov. 2001.
56. Combinatorics seminar, MSU Math, Oct. 2002.
57. Math Department, Melbourne Uni. (Aus.), Dec. 2002.
58. CMP Seminar, MSU, Sept. 2003
59. Applied math seminar, MSU, Oct. 2003
60. IQS seminar, MSU Oct. 2003
61. Physics Department Seminar, Syracuse University, Nov. 2003
62. Statistical Physics seminar, Physics Department Saarbruchen Univ. Germany, May 2004.
63. Complex systems seminar, Univ. Michigan, Oct. 2004.
64. CNLS colloquium, Los Alamos National Labs, Feb. 2005.
65. Seminar, Material Science Group, Livermore Labs, Sept. 2005.
66. Seminar, Material Science, Michigan State, Feb. 2006.
67. Seminar, Nanoscience dept., Delft Univ. of Technology, May. 2006.
68. Seminar, Cond. Matter Physics Group, Michigan State, Sept. 2006.
69. Colloquium, Physics Department, Oakland University, November 2006.
70. Science at the edge seminar, Michigan State, March 2007.
71. Energy seminar, Michigan State, March 2008.
72. CMP Seminar, Brookhaven National Laboratory NY, Feb. 2009.
73. APAM Colloquium, Columbia University NY, Feb. 2009.
74. Complex Materials Seminar MSU, Oct. 2009.
75. Seminar Applied Physics Department, Aalto University, Finland, February 2011.
76. Seminar, Department of Physics, Forteleza University Brazil, October 2014.
77. MSU CORE-CM seminar April 21 2016

78. APAM Colloquium, Columbia University NY, Nov. 2016.
79. Physics and Astronomy Department Colloquium, Temple University, October 2017

CURRENT RESEARCH GROUP

a. PhD Students

1. Tim Golubev
2. Bilal Jones
3. David Miller
4. Xukun Xiang

b. Postdoctoral Fellows

1. Brandon Zerbe
2. Non Thongpro (ending 12/15/2017)

SUPERVISION: Emeritus Students and Postdocs

a. PhD students supervised and completion dates

1. Yongsheng Li (1990), Lucent Corporation
2. Seongon Kim (1994), (David Tomanek co-supervised) Professor at Mississippi State University
3. Xinhua Yu (1994), Started career in Silicon valley – have lost track of him
4. Bane Blagojevic (1999), Physical verification engineer, Intel Corporation
5. Radu Dobrin (2002), Research staff, Janssen Laboratories
6. Jan Meinke (2002), Research staff, HLRZ Juelich
7. Erin McGarrity (2005), Pilot engineer, Mathworks
8. Radu Cojocaru (2006), Senior research development manager, Thermo Fisher
9. Chris Farrow (2007), Director of consulting (Americas), Enthought
10. Charles W. Fay (2007), Visiting Assistant Professor, Emory and Henry College
11. Jiwu Liu (2009), Software Development Engineer, Microsoft Research
12. Corey Musolff (2013), LON-CAPA instructor, MSU
13. Daniel Olds (2013), Staff, Oak Ridge National Laboratory
14. Saurabh Gujarathi (2014), Senior Software Engineer, Mathworks
15. Jenni Portman (2014), Scientific Software Developer, Enthought
16. Bin Hwang (2017), Machine Learning Group, Amazon Corporation
17. Non Thongpro (2017), Postdoctoral Fellow, MSU

b. Selected Masters students supervised

1. Z. Zhou (1999) - Staff at HP
2. Andreas Glaser (2003), Managing Director, Goldman Sachs

c. Selected Undergrad Researchers Supervised

1. Stephanie Palmer, B.Sc. MSU and Rhodes Scholar 1997, Now Assistant Professor Univ. Chicago
2. Aleks Donev; B.Sc. MSU 2001, Princeton Ph.D. Now Associate Professor at Courant Institute
3. Andrew Jones B.Sc. 2005, NSF Graduate Fellow, UC Boulder, Now postdoc at Univ. Wisc.
4. Patrick Harrington, B.Sc. 2007 MSU; Ph.D. UM. Co-founder and chief data Scientist, Paysa Inc.
5. Olgun Adak, B.Sc. 2011 MSU. Graduate School Columbia University, Now at BNL.
6. Connor Glosser, B.Sc. 2012. Now in graduate school in computational physics at MSU.

d. Past Postdoctoral Fellows

1. C. Moukarzel (Finished 1995), Professor at Merida (Mexico).
2. M. Alava (Finished 1996), Professor at Aalto University (Finland).
3. S. Bastea (Finished 1998), Staff at Livermore Labs.
4. Tibor Nagy (Finished 2003), Lab. specialist at MSU.
5. Jenni Portman (Finished 2014), Scientific Softeware Developer, Enthought Corporation

CURRENT GRANT SUPPORT

Federal Grants

1. ***GAANN: Interdisciplinary Training Program in Revolutionary Energy Materials***.
   I am PI, with 7 co-PIs.
   US Department of Education. $727,000, (9/1/2014 - 8/31/2018)
2. ***MRI: Development of a femtosecond angle-resolved electron microscopy system for mapping the 3D electronic structures and responses in functional materials and nanostructures.***
   C.-Y. Ruan is PI, I am co-PI with two other co-PIs.
   NSF. $971,941, (9/1/2016 - 8/31/2020)
3. ***MSU Traineeship Program to Address Critical Workforce Needs in Accelerator Science & Engineering***
   Peter Ostroumov is PI. I am co-PI with 5 other co-PIs.
   DOE. $990,000, (10/1/2017 – 9/30/2022)

Internal Support

1. ***Displacing Fossil Fuels with Multi-Junction Perovskite Photovoltaics***
   Tom Hamann is PI, I am co-PI with 6 other co-PIs
   Strategic Partnership Grant (SPG): $400k **(**7/1/2015 - 6/30/2018)
2. ***Center of Research Excellence in Complex Materials.***
   I am PI, but no longer director. There are 7 co-PIs. This center supports infrastructure purchases and builds teams for submitting external group proposals in the area of materials research.
   Office of the VP for research***:*** $2,500k (7/1/2009 – 6/30/2018)
3. ***Institute of Theoretical and Mathematical Physics ITMP***
   I am PI, with the directors Jeffrey Schenker (Math), Mark Dykman (PA).
   This center funds postdocs, seminars, visitors, workshops.
   Office of the VP for research: $300k (8/1/2015-8/1/2018)

PAST EXTERNAL GRANTS

1. ***MRI: Development of a femtosecond high brightness electron beam source for time-resolved electron diffraction and imaging*.**
   C.Y. Ruan was PI. I was a co-PI. There were two other co-PIs.
   NSF: $968k, (9/1/11-8/31/15)
2. ***Biomimetic microsystem for high throughput evaluation of engineered nanomaterials,***
   R.M. Worden was PI. I was co-PI with 6 other co-PIs,
   NIH, $450k, (9/28/2009 - 7/31/2012).
3. ***Interdisciplinary training program in bioelectronics.***
   PI – R.M. Worden. I was co-PI with 6 other co-PIs.
   US Dept. of Education, $613k, (8/1/2010 - 7/31/2013)
4. ***Statistical theories for failure in polycrystalline materials***
   Single Investigator Grant
   Petroleum Research Fund: $80,000 (7/1/2006-8/31/2009)
5. ***Generating high modulus fibers by nanoparticle incorporation with potential to introduce multifunctionality***
   PI – Michael Mackay. I was co-PI.
   US Army Research Office: $253k (8/16/2005 -8/15/2008)
6. ***Nanostructure determination by co-refining models to multiple data sets***
   Simon Billinge was PI, and I was co-PI
   DOE: $96,047 (9/1/2004-8/31/2007)
7. ***Network modeling of GBE materials***
   Single Investigator Grant
   Lawrence Livermore National Laboratory: $39,790 (1/1/2005-9/30/2005)
8. ***Cooperative geometric structures in disordered networks and complex materials***

Single Investigator Grant
DOE: $331,968 (8/1/2002-7/31/2005)

9. ***Polycrystalline fracture using network optimization algorithms***
   Single Investigator Grant
   Sandia National Laboratories: $59,567 (12/1/2003-9/30/2004)
10. ***NUE: Teaching modules on transport properties of polymer nanocomposites with layered materials***
    K. Jayaraman was PI. I was co-PI with two other co-PIs
    NSF: $100,000 (7/1/2004-6/30/2006)
11. ***Polycrystalline fracture using network optimization algorithms***
    Single investigator grant
    Sandia National Laboratories: $50,000 (12/1/2002 – 9/30/2003)
12. ***Polycrystalline fracture using network optimization algorithms***
    Single investigator grant
    Sandia National Laboratories: $49,005 (5/1/2002 – 9/30/2002)
13. ***Polycrystalline fracture using network optimization algorithms***
    Single investigator grant
    Sandia National Laboratories: $42,388 (3/31/2000 – 9/30/2001)
14. ***Polymers and interfaces***
    Single investigator grant
    DOE: $126,521 (8/1/2000 – 7/31/2001)
15. ***Optimization algorithms applied to disordered materials***
    Single investigator grant
    DOE: $221,165 (8/1/1999-7/31/2002)
16. ***Polycrystalline fracture using network optimization algorithms***
    Single investigator grant
    Sandia National Laboratories: $41,160 (3/31/2000 – 9/30/2000)
17. ***Disorder and failure: Plasticity, flux flow and fatigue***
    Single investigator grant
    DOE: $283,804 (8/1/1998-7/31/1999)
18. ***Professional masters degrees in the sciences at MSU***
    Estelle McGoarty was PI. I was a co-PI with two other co-PIs.
    Sloan Foundation: $400,000 (6/1/1998-5/30/2001)
19. ***Growth and stability of metal films and small metal structures***
    Single investigator grant
    NSF: $41,523 (5/8/1996-5/8/1997)
20. ***Disorder and failure: Selected applications to brittle fracture, critical current and dielectric breakdown.***
    Single investigator grant
    DOE: $133,705 (8/1/1993-9/2/1995)
21. ***Compressive and shear failure of porous materials***
    Single investigator grant
    Petroleum Research Fund: $50,000 (9//1993-8/31/1995)
22. ***Theoretical studies of breakdown in random media***
    Single investigator grant
    DOE: $204,320 (8/1/1990-8/13/1993)
23. ***Summer Internships in physics***
    Bill Lynch was PI. I was co-PI
    NSF: $37,925 (6/1/1991-11/30/1992)

TEACHING

a. Courses Taught

1989-1990
PHY493 (Quantum II) - Winter
PHY879 (Stat. Mech. III) - Spring
1990-1991
PHY942 (Solid State) - Winter
PHY289 (Intro. Phys. Recs. - Spring
1991-1992
PHY287 (Intro. Phys. Lec) - Fall
PHY942 (Solid State) - Spring
1992-1993
PHY183 (Intro. Phys. Lec) - Fall
PHY184 (Intro. Phys. Recs.) - Spring
1993-1994
Sabbatical year.
1994-1995
PHY184 (Intro. Phys. Lec.)-Fall
PHY184 (CAPA help) - Spring.
1995-1996
PHY471 (Quantum Mechanics) - Fall
PHY472 (Quantum Mechanics) - Spring
1996-1997
PHY205 (Concepts in Physics) - Fall
PHY205 (Physics Computations I) - Spring
1997-1998
PHY101 (Concepts in Physics) - Fall
PHY201 (Physics Computations II) - Fall
PHY972c (Superfluidity and Superconductivity) - Fall
PHY102 (Physics Computations I) - Spring
1998-1999
PHY101 (Concepts in Physics) - Fall PHY201 (Physics Computations II) - Fall PHY301 (Physics Computations III) - Fall PHY102 (Physics Computations I) - Spring
1999-2000
PHY101 (Concepts in Physics) - Fall PHY201 (Physics Computations II) - Fall PHY301 (Physics Computations III) - Fall PHY102 (Physics Computations I) - Spring
2000-2001
PHY201 (Physics Computations II) - Fall
PHY301 (Physics Computations III) - Fall
2001-2002
PHY201 (Physics Computations II) - Fall PHY102 (Physics Computations I) - Spring PHY832 (Grad. Statistical Physics) - Spring
2002 - 2003
PHY294 (Honors EM) - Fall
PHY832 (Graduate Stat. Mech.) - Spring
2003 - 2004
PHY294 (Honors EM) - Fall
PHY932 (Graduate CMP) - Spring (With Billinge)PHY480 (Computational Physics) - Spring
PHY102 (Physics Computations I) - Spring (With Billinge)

2004 - 2005
PHY294 (Honors EM) - Fall
PHY832 (Graduate Stat. Mech) - Spring (With Feig)
PHY480 (Computational Physics) - Spring
PHY102 (Physics Computations I) - Spring
2005 - 2006
PHY231 (Non-calculus physics) - Fall
PHY102 (Physics Computations I) - Spring
PHY905 (Computational Physics - International course) - Spring
2006 - 2007
PHY201 (Physics Computations II- Fortran) - Fall
PHY102 (Physics Computations I - Mathematica) - Spring
PHY480 (Computational Physics) - Spring
PHY905 (Computational Physics - International course) - Spring
2007 - 2008
PHY201 (Physics Computations II- Fortran) - Fall
PHY102 (Physics Computations I - Mathematica) - Spring
PHY480 (Computational Physics) - Spring
PHY832 (Computational Physics - International course) - Spring
2008 - 2009
PHY481 (EM I) - Fall
PHY102 (Physics Computations I - Mathematica) - Spring
PHY480 (Computational Physics) - Spring
2009 - 2010
PHY481 (EM I) - Fall
PHY480/PHY832 (Computational Physics) - Spring
2010 - 2011
PHY480/PHY832 (Computational Physics) - Spring
CEM913, MSE891 - Spring. I gave some lectures and participated in planning these two courses that cover interdisciplinary energy materials and systems.
2011-2012
PHY831 – Graduate Statistical Mechanics (Fall)
PHY480 – Computational Physics (Spring)
2012-2013
PHY831 – Graduate Statistical Mechanics (Fall)
PHY480 – Computational Physics (Spring)
2013-2014
PHY480 – Computational Physics (Spring)
2014-2015
PHY480 – Computational Physics (Spring)

b. Some special contributions to teaching

1. 1988/89 Bill Lynch and I re-established the Physics and Astronomy REU program
2. Over the years I have developed many new Graduate Special Topics Courses, including courses in ; Chaos, Greens functions, Superfluids and superconductors, Disordered systems etc. These courses typically attract 10 or more enrolled students and another 5 to 10 monitoring the course .
3. 1996-1998 I developed and introduced the new undergraduate "Physics Computations" courses PHY102, PHY201, PHY301. To support these courses I supervised the purchase and installation of a room full of computers for the students, along with the software required for the courses.

4. In 1996 I developed and introduced the "Concepts in physics course" (PHY101).
5. 7. In the spring semesters of 2004-2014 I ran an international course on computational physics with Jos Thijssen at Delft University of Technology. About 10 students/yr from Delft came to MSU in January for a week. In May a similar number of students from MSU go to Delft. The courses had a flipped Socratic teaching style and was very well appreciated by the students.
6. PI and Director of an MSU DE-GAANN program 2014-2018
   11 graduate students in CNS and ENG are enrolled in the program. I developed a special course for the program and ensure that the students have a mentored teaching experience as required by the GAANN program.

COMMITTEES AND SERVICE

a. Department committees and other service

- CMP seminars (86/87)
- *Chair* Deparmental computing committee (1987)
- Physics picnic (spring 88)
- REU program (88-90). *Chair* in 89. Bill Lynch and I received a 3yr NSF grant for this in 88.
- *Chair* CMP long range planning committee (88/89).
- ADCOM (CMP representative) (89-91).
- Graduate recruiting committee (90-92).
- Chairman review committee (90-91).
- CMP seminar (with Cowen) (91-92).
- Colloquia (one semester) (92-93).
- Sabbatical (93-94)
- ADCOM member (secretary) (94-96).
- *Chair* task force on "Computers for upper level physics courses?" (94-95).
- Colloquium (Fall 95).
- Advisor for the SPS (95-97)
- CMPT rep. on New building committee (98)
- *Chair* Graduate recruiting committee (1997-2000)
- *Chair* Graduate committee (1998-2000)
- Supervised reworking of the MSUPA www (1998-2000).
- CMPE senior search committee (1999-2001)
- CMPE junior search committee (1999-2001)
- *Chair* CMPT search committee (2001/2) - we hired Carlo Piermarocchi
- CMPE "Billinge" junior search (2002/3) - offer to Lipman
- Comp. Bio "Kuhn" junior search (2002/3) - we hired Weidemeyer and Feig
- CMP seminar, Fall 2002
- Science at the Edge Seminar 2003-5
- CMPE search committee (2003-4) - We hired CY Ruan and Lisa Lapidus
- ADCOM (CMP representative) (2003-5)
- Faculy supervisor for Lorie Neuman (2004)
- CMPE Cowen search committee (2004-6)
- *Chair* ADHOC committee to rewrite the grad. handbook (2005)
- PA ADCOM (2007-2010)
- PA COC (2004-2009)
- *Chair* PTRC committee full professors (2007-2008)
- Chair of the PA Statistical Mechanics Subject exam committee (2011-2013)
- PA space advisory committee (2005-2013)

- Chair of the Physics and Astronomy Department (May 2013 – present)

b. College committees and other service
- CNS faculty grievance committee (91-93).
- CNS Long range planning committee (1999).
- CNS Graduate fellowship committee (1999-2001)
- CNS Position management committee (2004-6)

c. University committees and other service
- Operations and finance committee (87-93)
- University Distinguished fellowship committee (1999,2000)
- Advisory committee, Nanomedicine conference (2006)
- IRGP physical sciences review panel (2003, 2006-present)
- Member of the Chair search committee, ECE department (2007)
- University integrity office panel (2007)
- *Chair* SPG physical sciences and engineering review panel (2008)
- Member, SPG review panel (2009)
- *Chair* of Search Committee to fill six faculty positions in CNS and engineering (2008-9)
- *Director* of the Center of Research Excellence (CORE) in complex materials (2009-2014)
- *Chair* SPG physical sciences and engineering review panel (2010)
- *Member* of iCER director search committee (2010-12)
- *Member* of search committee for Assistant VP for research (2011)
- Member of SPG review panel (2011)
- Advisory committee for CFMR (2003-4)
- Advisory committee for the CBM-QBMI (2003-2007)
- Director of CNDA (2007-2009)
- Director of CORE-CM (2009-2014)
- *Chair* of Search Committee to fill six faculty positions in CNS and engineering (2009/10)
- *Chair* Complex materials seminar (2007-2014)
- Member of Search Committee to fill four faculty positions in CNS (2010/11)
- Chair of the Physics and Astronomy Department (May 2013 – present)

d. External committees and service
- *Chair* and organizer March APS Meeting Sessions on fracture - 1988
- Midwest solid state theory conference (with Thorpe, Mahanti and Kaplan).
- NSF CARM review panel 1992.
- NSF MRG site review committee - Univ. of Wisconsin Madison 1992.
- International advisory committee IUTAM symposium on: "non-linear analysis of fracture" (1993-1995).
- Scientific advisory committee MSU-AMAC symposium, Oct. 1995
- *Chair of* conference on :"Dynamics of Xtal Surfaces and Interfaces" Aug. 1996
- NSF/Darpa VIP review panel Sept. 1996
- *Chair* conference on: "Combinatorial optimization and disordered systems" April 1997
- *Co-Chair* conference on: "Rigidity theory and applications" June 1998.
- *Chair* SIAM Minisymposium on: "Graph algorithms applied to disordered materials" May 1999
- *Chair* CFMR symposium on "Polymers and Biopolymers" Feb. 2000
- *Chair* Short course on "Random Combinatorial Problems", May 2002.
- *International advisory committee* conference on "Fluctuations and Scaling in Materials", Italy July 2007.
- *Science advisory panel-Mathematical Sciences* Irish Science Foundation, Dublin Oct. 2007.
- Supervisor/Judge Robot Ramble for the Science Olympiad (2006-2008).

- *Chair conference* on "Complex and nanostructured materials for energy applications", MSU June 2008.
- Lecturer, MST school for middle school students (July 2010).
- *Chair conference* on "Complex materials for energy applications", MSU June 2010
- *Executive committee,* Division of Materials Physics, APS (2010-2013)
- *NSF review panel* CMMT, Materials world network (March 2010)
- *Editor* Sissa, J. Statistical Physics, Theory and Experiment (2004-2012)
- Organizing committee of FEIS-1 (2013) and FEIS-2 (2015)
- Referee for NSF, DOE, PRF, BSF, Research Corporation etc.
- Referee for Phys. Rev. Letts, Phys Rev. B,E; J. Phys. A,C, Macromolecules, and several other journals.