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Physics of Condensed Matter and Complex Systems
T-4, MS B262
Los Alamos National Laboratory
Los Alamos, NM 87545
May 3, 2024

Education

1998	Ph. D. University of Michigan; Physics
1995	M. Sc. University of Michigan; Physics
1993	B. S. University of California, Irvine; Physics, minor Mathematics

Positions Held

Jan. 2003–present	Technical Staff Member, Theoretical Division, T-4, Physics of Condensed Matter & Complex Systems, Los Alamos National Laboratory
Dec. 2000–Dec. 2002	Richard P. Feynman Distinguished Postdoctoral Fellow, Center for Nonlinear Studies and Applied Physics Division, Los Alamos National Laboratory
1998–Nov. 2000	Postdoctoral Researcher, Department of Physics, University of California–Davis
Summers 2000–2003	Visiting Scientist, Materials Science Division, Argonne National Laboratory
1994–1998	Graduate Researcher, Department of Physics, University of Michigan
1992–1993	Undergraduate Researcher, Department of Physics, University of California, Irvine

Research Interests

Computational studies in condensed matter: soft matter, nanophysics, solid state, superconductivity, magnetic systems, complex systems, and biophysics.

Honors and Awards

2019	Outstanding Referee, American Physical Society
2019	Distinguished Referee, EPL
2017	Distinguished Referee, European Physical Journal
2017	Distinguished Performance Award, Large Team, Los Alamos National Laboratory
2011	Fellow, American Physical Society
2004	Research Achievement Award, Ratchet Cellular Automata, Los Alamos National Laboratory
2004	Distinguished Postdoctoral Team Award, Los Alamos National Laboratory
2001–2003	Richard P. Feynman Distinguished Fellow, Los Alamos National Laboratory
2000	Director's Fellow, Los Alamos National Laboratory
1998	Nominated for Campus-wide Distinguished Dissertation Award, University of Michigan
1995	Passed PhD preliminary examination with distinction, University of Michigan

Honors and Awards (Cont.)

1994–1998	Rackham Graduate Fellowship, University of Michigan
1993–1994	General Electric Graduate Fellowship
1993	Undergraduate Thesis: Control in Nonlinear Systems with Sequences of Pulses, University of California, Irvine

Grants (solo PI unless noted otherwise)

- "In-Situ Vortex Manipulation and Trapped Flux Removal in Superconducting Electronic Devices" with B. Jankó, Army Research Office Foundations of Superconducting Digital Logic, 2024–2027.
- "Strategies for Topological Quantum Computing with Braiding of Vortices and Skyrmions," Laboratory-Directed Research and Development–Exploratory Research, 2020–2023, $1,260,000.
- "Understanding and Controlling Skyrmion Dynamics with Nanostructures," Laboratory-Directed Research and Development–Exploratory Research, 2014–2017, $1,200,000.
- "Experimental and Computational Studies of Engineered Nanoparticle Aggregation in Human Tissue Models," Laboratory Directed Research and Development–Postdoctoral, 2012–2014, $450,000.
- "Computational Modeling of Topo-Taxis: Directing the Motion of Bacteria and Cells with Microfabricated Topologies," Laboratory-Directed Research and Development-Exploratory Research, 2010-2014, $1,200,000.
- "Critical and Crossover Behaviors at Jamming Transitions," Laboratory-Directed Research and Development-Exploratory Research, 2007–2010, $1,000,000.
- "The Physics of Algorithms," Laboratory-Directed Research and Development-Directed Research with M. Chertkov, 2006–2009, $4,500,000.
- "Statistical Physics of Infrastructure Networks," Laboratory-Directed Research and Development-Directed Research with Z. Toroczkai, E. Ben-Naim, M.B. Hastings, 2003–2006, $4,000,000.
- "Vortex Cellular Automata," Laboratory-Directed Research and Development (Argonne) with W.K. Kwok, B. Jankó, V. Metlushko, 2002, $1,000,000.
- "Statistical Properties of Granular Chains," Laboratory-Directed Research and Development-Exploratory Research with E. Ben-Naim, 2001, $1,000,000.

Teaching and Mentoring Experience

1996–1997	University of Michigan Laboratory Teaching Assistant, 8 sections of electricity and magnetism
Fall 1999	University of California–Davis, Guest lecturer, graduate solid state course (2 weeks)

Teaching and Mentoring Experience (Cont.)

Postdoctoral Researchers

2011–2012	Dr. Caizhi Zhou (Ph.D., Iowa State); co-mentors: C.J.O. Reichhardt, I. Beyerlein. "Nonequilibrium phases of dislocations in metals."
2011–2013	Dr. Jeff Drocco (Ph.D., Princeton); co-mentor: C.J.O. Reichhardt, "Controlled motion of self-driven particles and bacteria on artificial substrates."
2012–2014	Dr. Lena Lopatina (Ph.D., Liquid Crystal Institute, Kent State); co-mentor: C.J.O. Reichhardt, "Jamming, clogging, and shearing of granular polymers."
2012–2014	Dr. Ido Regev (Ph.D., Weissman); co-mentor: T. Lookman, "Shearing dynamics of amorphous materials."
2012–2015	Dr. Shizeng Lin (Ph.D., Tsukuba); co-mentors: A. Saxena, C. Batista, "Skyrmion dynamics."
2016–2019	Dr. Maxime Leroux (Ph.D., CNRS); co-mentor: Boris Maiorov, "Skyrmion dynamics."
2020–2021	Dr. Ayhan Duzgun (Ph.D., Liquid Crystal Institute, Kent State); co-mentor: Cristiano Nisoli, "Liquid crystal skyrmions."
2022–	Dr. Cody Schimming (Ph.D., University of Minnesota); "Active liquid crystals."

Graduate Students (•: thesis student; †: STEM minority student)

Summer 2001	John Wambaugh (Duke); "Ratchet induced segregation of non-spherical grains."
Fall 2003	•Michael Mikulis (UC-Davis); "Reentrant disordering of colloidal molecular crystals on two-dimensional periodic substrates."
Summer 2005	•Jing-Xian Lin (UC-Riverside); "Heterogeneities and topological defects in two-dimensional pinned liquids."
2005–2007	•Andras Libál (Notre Dame); "Dynamics, rectification, and fractionation for colloids on flashing substrates;" "Realizing colloidal artificial ice on arrays of optical traps;" Point defect dynamics in two-dimensional colloidal crystals;" "Vortex configurations and dynamics in elliptical pinning sites for high matching fields;" "Enhancing mixing and diffusion with plastic flow."
Summer 2006	Qiming Lu (RPI); "Reversible vortex ratchet effects and ordering in superconductors with simple asymmetric potential arrays."
Summer 2007	N. Robert Hayre (UC-Davis); "Prions and pattern forming systems."
Summer 2007	†Mew-Bing Wan (Washington University); "Rectification of swimming bacteria and self driven particle systems by arrays of asymmetric barriers."
Summer 2008	Patrick Johnson (Washington University); "Diverging length scales near the jamming transition."
Summer 2009	•†Lena Lopatina (Kent State); "Jamming in granular polymers."
Summer 2010	†Christian Vaca (UCLA); "Vortex nanorheology."
Summer 2012	Jeff Amelang (Caltech); "Dynamic regimes for driven colloidal particles on a periodic substrate at commensurate and incommensurate fillings."
2012–2014	•†Danielle McDermott (Notre Dame); "Domain and stripe formation between hexagonal and square ordered fillings of colloidal particles on periodic pinning substrates."
2012–2014	•Dipanjan Ray (Notre Dame); "Strongly enhanced vortex pinning by conformal crystal arrays;" "Vortex states in Archimedean tiling pinning arrays;" "Casimir effect in active matter systems."
Summer 2016	•Xiaoyu Ma (Notre Dame); "Reversible vector ratchets for skyrmion systems."

Teaching and Mentoring Experience (Cont.)

Summer 2016	Hong Nguyen (U South Florida); "Clogging and jamming transitions in periodic obstacle arrays."
Summer 2016	Csánad Sándor (Babes-Bolyai Univ.); "Dewetting and spreading transitions for active matter on random pinning substrates;" "Dynamic phases of active matter systems with quenched disorder;" "Collective transport for active matter run and tumble disk systems on a traveling wave substrate."
Summer 2017	•Xiaoyu Ma (Notre Dame), "Individual vortex manipulation and stick-slip motion in periodic pinning arrays."
Summer 2017	Huba Peter (Babes-Bolyai Univ.); "Crossover from clogging to jamming behavior in heterogeneous environments."
Summer 2017	Joshua Thibault (West Virginia Univ.); "Active laning."
2017	•Sebastian Díaz (UCSD); "Fluctuations and noise signatures of driven magnetic skyrmions;" "Avalanches and criticality in driven magnetic skyrmions."
2018	•Bart Brown (Virginia Tech); "Reversible to irreversible transitions in periodically driven skyrmion systems."
2018–2021	•We Li (Soochow Univ.); "Phonon spectra of two-dimensional lilquid dusty plasmas on a one-dimensional periodic substrate;" "Structures and diffusion of two-dimensional dusty plasmas on one-dimensional periodic substrates;" "Depinning dynamics of two-dimensional dusty plasmas on a one-dimensional periodic substrate;" "Oscillation-like diffusion of two-dimensional liquid dusty plasmas on one-dimensional periodic substrates with varied widths;" "Continuous and discontinuous transitions in the depinning of two-dimensional dusty plasmas on a one-dimensional periodic substrate;" "Structure and dynamical properties of two-dimensional dusty plasmas on one-dimensional periodic substrates;" "Phonon spectra of a two-dimensional solid dusty plasma modified by two-dimensional periodic substrates;" "Bidirectional flow of two-dimensional dusty plasma under asymmetric periodic substrates driven by unbiased external excitations."
2019	•Xiaoyu Ma (Notre Dame); "Quantum computing using Majorana fermions manipulated with superconducting vortices."
2019–2020	•Nicolas Vizarim (UNESP - Bauru, Brazil); "Skyrmion pinball."
2020	•Wenzhao Li (Notre Dame); "Vortex dynamics, pinning, and angle-dependent motion on moirè patterns;" "Vortex ordering and dynamics on Santa Fe artificial ice pinning arrays."
2020–2022	•J. C. Bellizotti Souza (UNESP - Bauru, Brazil); "Directional locking and the influence of obstacle density on skyrmion dynamics in triangular and honeycomb arrays;" "Skyrmion ratchet in funnel geometries."
2020–2023	•Levente Varga (Babes-Bolyai Univ.); "Active phases for particles on resource landscapes."
2020–2023	•Peter Forgacs (Babes-Bolyai Univ.); "Active matter shepherding and clustering in inhomogeneous environments."
Summer 2024	†Biborka Adorjani (Babes-Bolyai Univ.); " Motility induced phase separation and frustration in active matter swarmalators."

Undergraduate Students (†: STEM minority student)

1997–1998	John Wambaugh (University of Michigan); University of Michigan REU program; "Superconducting fluxon pump and lenses."

Teaching and Mentoring Experience (Cont.)

Summer 1998	Amit Mehta (Cornell); University of Michigan REU program; "Topological invariants in microscopic transport on rough landscapes: Morphology, hierarchical structure, and Horton analysis of riverlike networks of vortices."
Summer 1999	†Omari Fuller (Contra Costa College); UC-Davis Minority Undergraduate Research Participation in the Physical Sciences (MURPPS); "Atomic friction."
Summer 1999	†Rogelio Lepe (Sacramento City College); UC-Davis MURPPS; "Threshold dynamics in spring-block models at the edge of motion."
Summer 1999	†Yolanda Marchante-Ortiz (Solano Community College); UC-Davis MURPPS; "Detection of non-visible planets by star perturbation."
Summer 1999	†Carla Rivera (University of California–Davis); UC-Davis MURPPS; "Orbital stability and the three body problem."
Summer 2003	Jeff Drocco (Notre Dame); "Melting of two-species charged clusters in a parabolic trap;" "Multiscaling at Point J: Jamming is a critical phenomenon."
Summer 2007	†Niall Mangan (Clarkson); "Reversible to irreversible flow transition in periodically driven vortices."
Summer 2008	Evan Groopman (Washington University); "Jamming in systems with quenched disorder."
Summer 2009	Adam Iaizzi (Ithaca College); "Depinning of stripe phases."
Summer 2010	Chris Bairnsfather (Purdue); "The effect of pinning on drag in coupled 1D channels of particles;" "Positive and negative drag, dynamic phases, and commensurability."
Summer 2010	Thuc Mai (Syracuse); "Active matter on asymmetric substrates."
Summer 2015	Minh Quan Le Thien (Wabash College); "Orientational ordering, buckling, and dynamic transitions for vortices interacting with a periodic quasi-one dimensional substrate."
Summer 2016	Minh Quan Le Thien (Wabash College); "Enhanced pinning for vortices in hyperuniform substrates and emergent hyperuniform vortex states."
Summer 2016	Yang Yang (Wabash College); "Dynamic phases, clustering, and lane formation for driven disk systems in the presence of quenched disorder."
Summer 2017	Maciej Olszewski (Notre Dame); "Structural transitions in vortex systems with anisotropic interactions."
2021–2023	Daniel Minogue (Notre Dame); "Lattice rotations in vortex systems with anisotropic interactions."
2021–2023	Ted Roe (Notre Dame); "Driven dynamics of vortex systems with anistropic interactions."
2022–2023	†Ágí Neda (Babeș Bolyai); "Transition from susceptible-infected to susceptible-infected-recovered dynamics in a susceptible-cleric-zombie-recovered active matter model."

Professional Service

Referee (Grants): National Science Foundation, Department of Energy, Cottrell Research Corporation, Petroleum Research Fund, Guggenheim Foundation, Israeli Science Foundation, Research Foundation Flanders, Keck Foundation, Swiss Science Foundation, Dutch Research Council (NWO), Natural Sciences and Engineering Research Council of Canada, Research Councils of the University of Liège, European Research Council

Professional Service (Cont.)

Referee (Journals): Nature, Nature Communications, Nature Physics, Scientific Reports, Science Advances, Physical Review Letters, Physical Review Research, Physical Review Applied, Physical Review Materials, Physical Review X, Physical Review A, Physical Review B, Physical Review E, Europhysics Letters, Proceedings of the National Academy of Science (USA), Proceedings of the National Academy of Science Nexus, New Journal of Physics, European Physics Journal E, Physica **B**, Physica **C**, Physica **D**, Physics Letters **A**, Reviews of Modern Physics, Journal of Physics B, Solid State Communications, Soft Matter, Journal of Non-Crystalline Solids, Journal of Superconducting Science and Technology, Journal of Magnetism and Magnetic Materials, Frontiers in Physics, Computational Materials Science, npj Computational Materials, Communications Physics, Physica Status Solidi (B), CrystEngComm, Chaos, Axioms, Symmetry, Applied Sciences, Entropy, Journal of Optics

Service: Co-organizer, CNLS 23rd Annual Conference on Networks: Structure, Dynamics and Function. Co-organizer, Third Summer Conference on Statistical Physics, July 26-Aug. 6, 2004 (LANL). CNLS Colloquium organizer, 2003-4. Member, T-13 group leader search committee, 2006. Member, Steering Committee of the Nanoscience and Engineering in Superconductivity Network, 2007. Member, LANL Fellows Committee, 2007. Session organizer, APS March Meeting, 2009. Co-organizer, CNLS Workshop on Complex Dynamics of Dislocations, Defects, and Interfaces, Nov. 14-16, 2011. Member, LANL Fellows Committee, 2012. PhD committee member, Unnar Anralds, Uppsala University, 2012. PhD committee member, Biplab Bag, IIT Kanpur, 2016. Session organizer, MRS Fall Meeting, 2016. Member, LDRD Science Advisory Panel, 2016–2019. Panel Member, Flanders Science Foundation, 2019-present. PhD committee member, Ankit Kumar, IIT Kanpur, 2020. Member, APS GSNP Dissertation Award Panel, 2021. Session organizer, APS March Meeting, 2023. Member, LDRD Atomic, Molecular, Quantum, Optical Sciences Panel, 2023-present.

Computer Experience

Techniques: Parallel and serial computing techniques, molecular and Brownian dynamics, classical Monte Carlo, development of new measures for complex systems.
Languages: FORTRAN, C, MPI, HTML.

Patents

"Method and apparatus for enhancing vortex pinning by conformal crystal arrays," U.S. Patent No. 9,082,923 B2.

Publicity

APS News, "Controlling a zombie outbreak - and beyond," April 2023. "Transition from susceptible-infected to susceptible-infected-recovered dynamics in a susceptible-cleric-zombie-recovered active matter model" [PRE **107**, 024604 (2023)].
Physical Review E Kaleidoscope, April 2020. "Detecting depinning and nonequilibrium transitions with unsupervised machine learning" [PRE 101, 042101 (2020)].
Physical Review B Kaleidoscope, December 2019. "Chiral edge currents for ac-driven skyrmions in confined pinning geometries" [PRB 100, 174414 (2019)].

Publicity (Cont.)

Physical Review E Kaleidoscope, August 2018. "Laning and clustering transitions in driven binary active matter systems" [PRE **98**, 022603 (2018)].
Soft Matter cover image, 28 January 2018. "Velocity force curves, laning, and jamming for oppositely driven disk systems" [Soft Matter **14**, 490 (2018)].
Physical Review Letters Editors' Suggestion, January 2018. "Inner phases of colloidal hexagonal ice" [PRL **120**, 027204 (2018)].
Physical Review B Kaleidoscope, May 2015. "Reversible ratchet effects for vortices in conformal pinning arrays" [PRB **91**, 184502 (2015)].
Physical Review B Kaliedoscope, March 2015. "Quantized transport for a skyrmion moving on a two-dimensional periodic substrate" [PRB **91**, 104426 (2015)].
Physical Review Letters Editors' Suggestion, June 2013. "Strongly enhanced pinning of magnetic vortices in type-II superconductors by conformal crystal arrays" [PRL **110**, 267001 (2013)].
Physical Review E Kaleidoscope, July 2011. "Jamming in granular polymers" [PRE **84**, 011303 (2011)].
Physical Review Focus, June 20, 2003 and **Technology Research News**, July 16/23, 2003. "Ratchet Cellular Automata" [PRL **90**, 247004 (2003)].

Citations

Over 15060 citations; h-index: 60 (source: Google Scholar).

Summary of Refereed Publications

3 Rev. Mod. Phys.
1 Nature
1 Nature Mater.
3 Nature Phys.
1 Rep. Prog. Phys.
1 Ann. Rev. Condens. Matter Phys.
4 Nature Commun.
1 Proc. Natl. Acad. Sci. (USA)
44 Phys. Rev. Lett.
5 Sci. Rep.
68 Phys. Rev. B
1 Eur. Rev
3 Appl. Phys. Lett.
16 New J. Phys.
10 Soft Matter
3 J. Chem. Phys.
1 Supercond. Sci. Technol.
1 J. Mag. Mag. Mater.
2 Phys. Lett. A
2 J. Appl. Phys.
7 Phys. Rev. Res.
72 Phys. Rev. E
10 J. Phys.: Condens. Matter
2 Commun. Phys
3 Phys. Plasmas
12 EPL
3 Eur. Phys. J. E
1 Phil. Mag. B
2 Eur. Phys. J. B
10 Physica C
1 Low Temp. Phys.
1 MRS Adv.
2 J. Phys. Commun.
1 Model. Sim. Mater. Sci. Eng.
1 Front. Phys.
1 Weap. Eng. Symp. J.

Publications in Refereed Journals

1. "Microscopic derivation of magnetic-flux-density profiles, magnetization hysteresis loops, and critical currents in strongly pinned superconductors." C. Reichhardt, C. J. Olson, J. Groth, S. Field, and F. Nori, Phys. Rev. B **52**, 10 441 (1995).

2. "Vortex plastic flow, local flux density, magnetization hysteresis loops, and critical current, deep in the Bose-glass and Mott-insulator regimes." C. Reichhardt, C. J. Olson, J. Groth, S. Field, and F. Nori, Phys. Rev. B Rapid Communications **53**, R8898 (1996).

3. "Vortex plastic motion in twinned superconductors." J. Groth, C. Reichhardt, C. J. Olson, S.B. Field, and F. Nori, Phys. Rev. Lett. **77**, 3625 (1996).

4. "Spatio-temporal dynamics and plastic flow of vortices in superconductors with periodic arrays of pinning sites." C. Reichhardt, J. Groth, C. J. Olson, S.B. Field, and F. Nori, Phys. Rev. B **54**, 16 108 (1996).

5. "Dynamic phases of vortices in superconductors with periodic pinning." C. Reichhardt, C. J. Olson, and F. Nori, Phys. Rev. Lett. **78**, 2648 (1997).

6. "Plastic flow, voltage noise, and vortex avalanches in superconductors." C. J. Olson, C. Reichhardt, J. Groth, S.B. Field, and F. Nori, Physica C **290**, 89 (1997).

7. "Superconducting vortex avalanches, voltage bursts, and vortex plastic flow: effect of the microscopic pinning landscape on the macroscopic properties." C. J. Olson, C. Reichhardt, and F. Nori, Phys. Rev. B **56**, 6175 (1997).

8. "Fractal networks, braiding channels, and voltage noise in intermittently flowing rivers of quantized magnetic flux." C. J. Olson, C. Reichhardt, and F. Nori, Phys. Rev. Lett. **80**, 2197 (1998).

9. "Commensurate and incommensurate vortex states in superconductors with periodic pinning arrays." C. Reichhardt, C. J. Olson, and F. Nori, Phys. Rev. B. **57**, 7937 (1998).

10. "Nonequilibrium dynamic phases and plastic flow of driven vortex lattices in superconductors with periodic arrays of pinning sites." C. Reichhardt, C. J. Olson, and F. Nori, Phys. Rev. B **58**, 6534 (1998).

11. "Nonequilibrium dynamic phase diagram for vortex lattices." C. J. Olson, C. Reichhardt, and F. Nori, Phys. Rev. Lett. **81**, 3757 (1998).

12. "Phase locking, Devil's staircase, Farey trees, and Arnold tongues in driven vortex lattices with periodic pinning." C. Reichhardt and F. Nori, Phys. Rev. Lett. **82**, 414 (1999).

13. "Topological invariants in microscopic transport on rough landscapes: morphology, hierarchical structure, and Horton analysis of riverlike networks of vortices." A. P. Mehta, C. Reichhardt, C. J. Olson, and F. Nori, Phys. Rev. Lett. **82**, 3641 (1999).

14. "Comment on 'Peak effect and the transition from elastic to plastic depinning.' " C. Reichhardt, K. Moon, R. Scalettar, and G. Zimányi, Phys. Rev. Lett. **83**, 2282 (1999).

Publications in Refereed Journals (Cont.)

15. "Superconducting fluxon pumps and lenses." J. F. Wambaugh, C. Reichhardt, C. J. Olson, F. Marchesoni, and F. Nori, Phys. Rev. Lett. **83**, 5106 (1999).

16. "Dynamic vortex phases and pinning in superconductors with twin boundaries." C. Reichhardt, C. J. Olson, and F. Nori, Phys. Rev. B **61**, 3665 (2000).

17. "Transverse depinning in strongly driven vortex lattices with disorder." C. J. Olson and C. Reichhardt, Phys. Rev. B Rapid Communications **61**, R3811 (2000).

18. "Vortices freeze like window glass: the Vortex Molasses scenario." C. Reichhardt, A. van Otterlo and G. T. Zimányi, Phys. Rev. Lett. **84**, 1994 (2000).

19. "Phase-locking of vortex lattices interacting with periodic pinning." C. Reichhardt, R. T. Scalettar, G. T. Zimányi, and N. Grønbech-Jensen, Phys. Rev. B Rapid Communications **61**, R11914 (2000).

20. "Melting of moving vortex lattices in systems with periodic pinning." C. Reichhardt and G. T. Zimányi, Phys. Rev. B **61**, 14354 (2000).

21. "Collective multi-vortex states in periodic arrays of traps." C. Reichhardt and N. Grønbech-Jensen, Phys. Rev. Lett. **85**, 2372 (2000).

22. "Critical currents and vortex states at fractional matching fields in superconductors with periodic pinning." C. Reichhardt and N. Grønbech-Jensen, Phys. Rev. B **63**, 054510 (2001).

23. "Moving Wigner glasses and smectics: dynamics of disordered Wigner crystals." C. Reichhardt, C.J. Olson, N. Grønbech-Jensen, and F. Nori, Phys. Rev. Lett. **86**, 4354 (2001).

24. "Complex dynamical flow phases and pinning in superconductors with rectangular pinning arrays." C. Reichhardt, G.T. Zimányi, and N. Grønbech-Jensen, Phys. Rev. B **64**, 014501 (2001).

25. "Critical depinning force and vortex lattice order in disordered superconductors." C.J. Olson, C. Reichhardt, and S. Bhattacharya, Phys. Rev. B **64**, 024518 (2001).

26. "Individual and multiple vortex pinning in systems with periodic pinning arrays." C. Reichhardt, G.T. Zimányi, R.T. Scalettar, A. Hoffmann, and I.K. Schuller, Phys. Rev. B **64**, 052503 (2001).

27. "Phase-locking of driven vortex lattices with transverse ac force and periodic pinning." C. Reichhardt, A.B. Kolton, D. Domínguez, and N. Grønbech-Jensen, Phys. Rev. B **64**, 134508 (2001).

28. "Hysteretic depinning and dynamical melting for magnetically interacting vortices in disordered layered superconductors." C.J. Olson, C. Reichhardt, and V.M. Vinokur, Phys. Rev. B Rapid Communications **64**, 140502(R) (2001).

29. "Commensurate and incommensurate vortex lattice melting in periodic pinning arrays." C. Reichhardt, C.J. Olson, R. T. Scalettar, and G. T. Zimányi, Phys. Rev. B **64**, 144509 (2001).

30. "Collective interaction-driven ratchet for transporting flux quanta." C.J. Olson, C. Reichhardt, B. Jankó, and F. Nori, Phys. Rev. Lett. **87**, 177002 (2001).

Publications in Refereed Journals (Cont.)

31. "Ratchet-induced segregation and transport of non-spherical grains." J.F. Wambaugh, C. Reichhardt, and C.J. Olson, Phys. Rev. E **65**, 031308 (2002).

32. "Transverse depinning of a driven elastic string in disordered media." C. Reichhardt and C.J. Olson, Phys. Rev. B **65**, 094301 (2002).

33. "Vortex pinball under crossed ac drives in superconductors with periodic pinning arrays." C. Reichhardt and C.J. Olson, Phys. Rev. B Rapid Communications **65**, 100501(R) (2002).

34. "Effect of grain anisotropy on ordering, stability, and dynamics in granular systems." C.J. Olson, C. Reichhardt, M. McCloskey, and R.J. Zieve, Europhys. Lett. **57**, 904 (2002).

35. "Transverse phase locking for vortices in square and triangular pinning arrays." C. Reichhardt and C.J. Olson, Phys. Rev. B **65**, 174523 (2002).

36. "Novel colloidal crystalline states on two dimensional periodic substrates." C. Reichhardt and C.J. Olson, Phys. Rev. Lett. **88**, 248301 (2002).

37. "Rectification and phase locking for particles on two dimensional periodic substrates." C. Reichhardt, C.J. Olson, and M.B. Hastings, Phys. Rev. Lett. **89**, 024101 (2002).

38. "Colloidal dynamics on disordered substrates." C. Reichhardt and C.J. Olson, Phys. Rev. Lett. **89**, 078301 (2002).

39. "Dynamical behaviors of quasi-one-dimensional vortex states: Possible applications to the vortex chain state." C. Reichhardt and C.J. Olson Reichhardt, Phys. Rev. B **66**, 172504 (2002).

40. "Disordering transitions in vortex matter: Peak effect and phase diagram." C.J. Olson, C. Reichhardt, R.T. Scalettar, G.T. Zimányi, and N. Grønbech-Jensen, Physica C **384**, 143 (2003).

41. "Dynamical ordering of driven stripe phases in quenched disorder." C. Reichhardt, C.J. Olson Reichhardt, I. Martin, and A.R. Bishop, Phys. Rev. Lett. **90**, 026401 (2003).

42. "Depinning and dynamics of systems with competing interactions in quenched disorder." C. Reichhardt, C.J. Olson, I. Martin, and A.R. Bishop, Europhys. Lett. **61**, 221 (2003).

43. "Charge transport transitions and scaling in disordered arrays of metallic dots." C. Reichhardt and C.J. Olson Reichhardt, Phys. Rev. Lett. **90**, 046802 (2003).

44. "Fluctuating topological defects in 2D liquids: Heterogeneous motion and noise." C. Reichhardt and C.J. Olson Reichhardt, Phys. Rev. Lett. **90**, 095504 (2003).

45. "Depinning by fracture in a glassy background." M.B. Hastings, C.J. Olson Reichhardt, and C. Reichhardt, Phys. Rev. Lett. **90**, 098302 (2003).

46. "Metastability and transient effects in vortex matter near a decoupling transition." C.J. Olson, C. Reichhardt, R.T. Scalettar, G.T. Zimányi, and N. Grønbech-Jensen, Phys. Rev. B, **67**, 184523 (2003).

Publications in Refereed Journals (Cont.)

47. "Ratchet cellular automata." M.B. Hastings, C.J. Olson Reichhardt, and C. Reichhardt, Phys. Rev. Lett. **90**, 247004 (2003). Also featured in Phys. Rev. Focus.

48. "Effect of field-effect transistor geometry on charge ordering of transition metal oxides." C.J. Olson Reichhardt, C. Reichhardt, D.L. Smith, and A.R. Bishop, Phys. Rev. B **68**, 033101 (2003).

49. "Absolute transverse mobility and ratchet effect on periodic two-dimensional symmetric substrates." C. Reichhardt and C.J. Olson Reichhardt, Phys. Rev. E **68**, 046102 (2003).

50. "Temperature and ac effects on charge transport in arrays of metallic dots." C. Reichhardt and C.J. Olson Reichhardt, Phys. Rev. B **68**, 165305 (2003).

51. "Structure and melting of two-species charged clusters in a parabolic trap." J.A. Drocco, C.J. Olson Reichhardt, C. Reichhardt, and B. Jankó, Phys. Rev. E Rapid Communications **68**, 060401(R) (2003).

52. "Fibrillar templates and soft phases in systems with short-range dipolar and long-range interactions." C.J. Olson Reichhardt, C. Reichhardt, and A.R. Bishop, Phys. Rev. Lett. **92**, 016801 (2004).

53. "Local melting and drag for a particle driven through a colloidal crystal." C. Reichhardt and C.J. Olson Reichhardt, Phys. Rev. Lett. **92**, 108301 (2004).

54. "Directional locking effects and dynamics for particles driven through a colloidal lattice." C. Reichhardt and C.J. Olson Reichhardt, Phys. Rev. E **69**, 041405 (2004).

55. "Nonlinear dynamics, rectification, and phase locking for particles on symmetrical two-dimensional periodic substrates with dc and circular ac drives." C. Reichhardt, C.J. Olson Reichhardt, and M.B. Hastings, Phys. Rev. E **69**, 056115 (2004).

56. "Dynamic regimes and spontaneous symmetry breaking for driven colloids on triangular substrates." C. Reichhardt and C. J. Olson Reichhardt, Europhys. Lett. **68**, 303 (2004).

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3. ESF Workshop on Structure and Arrangement of Vortices in Superconductors (Prague, Czech Republic, April 2002); "Interference effects in 2D and 1D vortex matter in periodic pinning potentials with ac and dc drives."

4. SPIE Second International Symposium on Fluctuations and Noise (Gran Canarias, Spain, May 2004); "Noise near charge ordering transitions."

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6. 11th International Workshop on Vortex Matter (Wroclaw, Poland, July 2006); "Vortex configurations and artificial spin ice in elliptical pinning sites."

7. SPIE Conference, Noise and Fluctuations in Circuits, Devices and Materials (Florence, Italy, May 2007); "Hysteresis and noise in stripe and clump forming systems."

8. Sixth International Conference on Vortex Matter in Nanostructured Superconductors (Rhodes, Greece, September 2009); "Jamming and diode effects for vortices in nanostructured superconductors."

9. Southern Workshop on Granular Materials 2009 (Vi na del Mar, Chile, December 2009); "Jamming in granular polymers."

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11. International Conference on Electromagnetics in Advanced Applications (Sydney, Australia, September 2010); "Transport and hysteresis in artificial ice systems."

12. International Conference on "Frontiers of Condensed Matter Physics", NORDITA (Stockholm, Sweden, January 2011); "Pattern formation from competing interactions: Implications for soft and hard condensed matter systems."

13. 8th European Conference on Mathematical and Theoretical Biology (Krakow, Poland, June 2011); "Guided motion of individual and collective swimmers in funnel arrays."

14. Seventh International Conference on Vortex Matter in Nanostructured Superconductors (Rhodes, Greece, September 2011); "Dynamics and directional locking of colloids on quasicrystalline substrates."

Invited Talks at Conferences and Workshops – International (Cont.)

15. Pathbreaking Phase Sciences in Superconductivity 2012 (Osaka, Japan, January 2012); "Statics and dynamics of vortex matter with competing interactions in multi-band superconductors."

16. BIT 1st Annual World Congress of Advanced Materials–2012 (Beijing, China, June 2012); "Complex phases for systems with competing repulsive and attractive interactions: Implications for vortex matter and charge ordering systems."

17. 57th DAE-Solid State Physics Symposium (Mumbai, India, December 2012); "Jamming, clogging, and depinning in systems with random and periodic substrates."

18. Second International Workshop on Nonlinear Response in Complex Matter (Erlangen, Germany, February 2013); "Jamming, clogging, and depinning in systems with quenched disorder."

19. 14th International Workshop on Vortex Matter in Superconductors (Nanjing, China, May 2013); "Dynamics of vortices and skyrmions in the presence of pinning."

20. Conference on Current-Driven Magnetisation Dynamics (Leeds, United Kingdom, January 2014); "Skyrmion dynamics in chiral magnets."

21. SKYMAG 2014 Challenges and New Directions for Magnetic Skyrmions (Paris, France, April 2014); "Static and dynamic phases of skyrmions in chiral magnets interacting with random and periodic pinning arrays."

22. CECAM conference, Flow and Clogging in Bottlenecks: Simulations and Experiments (Zaragoza, Spain, September 2014); 'Distinguishing between jamming and clogging transitions of particles in obstacle arrays."

23. CECAM conference, Friction and Interface Dynamics at nano and mesoscales (Tel Aviv, Israel, October 2014); "The dynamics of active matter particles on periodic disordered landscapes."

24. International Workshop on Vortex Matter in Superconductors - Vortex 2015 (El Escorial, Spain, May 2015); "Nonequilibrium dynamics of skyrmion lattices in random and ordered substrates."

25. 24th International Material Research Congress (Cancun, Mexico, August 2015); "Nonequilibrium dynamics of skyrmion lattices in random and ordered substrates."

26. ISS2015 28th International Symposium on Superconductivity (Tokyo, Japan, November 2015); "Vortex and skyrmion lattices in random and ordered potential landscapes."

27. 3rd Toyota RIKEN International Workshop (Nagoya, Japan, July 2016) "Dynamic phases of skyrmions and vortices on pinning landscapes."

28. International Conference on Plasticity (Puerto Vallarta, Mexico, January 2017); "Reversible avalanches and criticality in amorphous solids."

29. 10th International Conference on Computational Physics (Macau, January 2017); "Statics and dynamics of skyrmions in random and ordered potential landscapes."

Invited Talks at Conferences and Workshops – International (Cont.)

30. SkyMag 2017 (Paris, France, May 2017) "Fluctuations, noise, and avalanches in driven skyrmion systems."

31. 16th International Workshop on Vortex Matter in Superconductors - Vortex2017 (Natal, Brazil, June 2017) "Dynamic phases and Hall effect in driven skyrmion systems."

32. Sol-SkyMag 2017 International Conference on Magnetism and Spintronics (San Sebastian, Spain, June 2017) "Dynamic phases and Hall effect in driven skyrmion systems."

33. Loch Lomond Workshop on Artificial Spin Ice (Loch Lomond, Scotland, June 2017) "Particle based artificial spin ice systems."

34. DPG-Fruhjahrstagung (DPP Spring Meeting) and EPS-CMS27 (Berlin, Germany, March 2018) "Skyrmion dynamics, creep, and avalanches."

35. 9th International Conference on Multiscale Materials Modeling (Osaka, Japan, October 2018) "Reversible avalanches and criticality in amorphous solids."

36. Workshop on Frontiers in Artificial Spin Ice (Bad Zurzach, Switzerland, February 2019) "Defect coarsening and the Zurek-Kibble mechanism for rapid quenches in artificial spin ice systems."

37. 2019 International Workshop on Soft Matter and Biophysics Theories (Beijing, China, May 2019) "Jamming and clogging of passive and active particles in disordered media."

38. XVII International Workshop on Vortex Matter in Superconductors (Antwerp, Belgium, May 2019) "Skyrmion Hall effect, avalanches and clustering."

39. Workshop on Yielding Phenomena in Disordered Systems (Bariloche, Argentina, July 2019) "Reversibility and criticality in amorphous solids."

40. Pathways, Sequence and Memory workshop (virtual; hosted by Leiden University, April 2020) "Memory formation with orthogonal driving."

41. 18th Online International Vortex Conference 2021 (virtual; hosted by New Delhi, India, May-June 2021) "Vortex and skyrmion dynamics on moirè superlattices."

42. Transport in Narrow Channels (Cargese, France, Sep. 2022) "Clogging, dynamics and reentrant fluid for active matter on periodic and random substrates."

43. Pathways, Memory, and Emergent Computation in Nonequilibrium Systems (Sede Boqer, Israel, May 2023) "Clogging, dynamics, and memory in complex environments."

44. Frontiers in Artificial Spin Ice 2023 (Lenzburg, Switzerland, June 2023) "Active matter spin ice."

45. Miniworkshop, Active and Frustrated Systems International Meeting on Complex Systems (Mindanao State University Iligan Institute of Technolgy) Online Talk, Oct 2023. " Active Matter Mott and Clogged States on Ordered Substrates."

46. Transport in Narrow Channels (Cargese, France, Sep. 2024) "Clogging and dynamics of active matter and skyrmions in narrow channels."

Invited Talks at Conferences and Workshops – Domestic

47. Workshop on Computational Superconductivity (Argonne, IL, March 1996); "Vortex dynamics in superconductors with periodic pinning arrays."

47. Campus-Laboratory Collaboration on the Physics of Vortex Matter Meeting (Davis, CA, December 1998); "Vortex pinning and dynamics in superconductors with periodic pinning arrays."

48. Campus-Laboratory Collaboration on the Physics of Vortex Matter Meeting (Irvine, CA, May 1999); "Melting of moving vortex lattices interacting with periodic pinning arrays."

49. Campus-Laboratory Collaboration on the Physics of Vortex Matter Meeting (Los Alamos, NM, September 1999); "Shapiro steps in driven vortex lattices in periodic pinning arrays."

50. Campus-Laboratory Collaboration on the Physics of Vortex Matter Meeting (San Diego, CA, January 2000); "Vortex pinning and dynamics in superconductors with rectangular pinning arrays."

51. American Physical Society March Meeting invited talk (Minneapolis, MN, March 2000); "Vortices freeze like window glass: the vortex molasses scenario."

52. Campus-Laboratory Collaboration on the Physics of Vortex Matter Meeting (Los Alamos, NM, September 2000); "Hysteretic depinning and dynamical melting for magnetically interacting vortices."

53. Campus-Laboratory Collaboration on the Physics of Vortex Matter Meeting (Tahoe, CA, February 2001); "Transverse phase locking of vortices interacting with periodic substrates."

54. Gordon Research Conference–Condensed Matter Physics (New London, CT, June 2001); "Static and dynamic vortex states in layered superconductors."

55. Miniworkshop on Dynamics in Assorted Systems (Albuquerque, NM, November 2002); "Transverse depinning of a driven elastic string in a disordered media."

56. 34th Winter Colloquium on the Physics of Quantum Electronics (Snowbird, UT, January 2004); "Ratchets in nanostructured superconductors."

57. Arizona Days 2004 (Los Alamos, NM, January 2004); "Ratchets in nanostructured superconductors."

58. SPIE Conference on Optical Trapping and Optical Micromanipulation (Denver, CO, August 2004); "Statics and dynamics of colloidal particles in periodic traps."

59. International Conference on Mesoscopic Superconductivity and Magnetism (Chicago, IL, August 2006); "Vortex ordering and ratchet effects in nanoscale superconductors with one dimensional asymmetric substrates."

60. 8th International Electrokinetics Conference (Santa Fe, NM, May 2008); "Colloids as a model system to explore complex matter."

Invited Talks at Conferences and Workshops – Domestic (Cont.)

61. SPIE Conference on Optical Trapping and Optical Micromanipulation VI (San Diego, CA, August 2009); "Dynamics of colloidal particles on optical trap arrays."

62. Conference on Thermodynamics and Kinetics in Molecular Motors (Santa Fe, NM, May 2010); "Computational modeling of directed motion in self-driven systems such as bacteria and cells."

63. 30th Center for Nonlinear Studies Annual Conference: Complexity and Disorder at Ultra-Low Temperatures (Santa Fe, NM, June 2010); "Complex matter with competing interactions."

64. 13th International Workshop on Vortex Matter in Superconductors (Chicago, IL, August 2011); "Jamming, clogging, and depinning in vortex matter."

65. SPIE Conference on Optical Trapping and Optical Micromanipulation VIII (San Diego, CA, August 2011); "Dynamics and directional locking of colloids on quasicrystalline substrates."

66. SPIE Conference on Optical Trapping and Optical Micromanipulation IX (San Diego, CA, August 2012); "Statics and dynamics of wetting-dewetting transitions for particles with attractive interactions on periodic and random substrates."

67. ACS 2014 Colloid and Surface Science Symposium (Philadelphia, PA, June 2014); "Active matter transport and jamming on disordered landscapes."

68. Conference on Strongly Coupled Coulomb Systems (Santa Fe, NM, July 2014); "Pattern formation from competing interactions: Implications for soft and hard condensed matter systems."

69. SPIE Conference on Optical Trapping and Optical Micromanipulation XI (San Diego, CA, August 2014); "Ordering and dynamics of colloids with competing interactions on one-dimensional periodic substrates."

70. American Physical Society March Meeting invited talk (San Antonio, TX, March 2015); "Reversible avalanches and criticality in amorphous solids."

71. SPIE Conference on Optical Trapping and Optical Micromanipulation XIII (San Diego, CA, August 2016); "Trapping, ordering, and dynamics of active matter systems in confined geometries."

72. Skyrmionics: Materials, Phenomena, and Applications (Santa Fe, NM, August 2017) "Dynamic phases and Hall effect in driven skyrmion systems."

73. Center for Nonlinear Studies Conference on Emergent Topological Order in Classical Systems (Santa Fe, NM, August 2018) Skyrmion dynamics, pinning and avalanches."

74. Materials Research Society 2018 Fall Meeting (Boston, MA, November 2018) "Skyrmion Hall effect, avalanches and clustering."

75. Pathways, Sequence, and Memory (Virtual, June 2020) "Memory formation with orthogonal driving."

Invited Talks at Conferences and Workshops – Domestic (Cont.)

76. SPIE Conference on Optical Trapping and Optical Micromanipulation XIX (San Diego, CA, August 2022) "Ordering and dynamics of active matter systems on static and dynamic periodic optical substrates."

77. Workshop on Recent Advances in the Physics of Strongly Correlated Low-Dimensional Electron Systems (Northeastern University, Boston, MA, September 2022) "Driven dynamics, nonlinear dynamics, avalanches, Hall effect, and noise for driven Wigner crystals."

78. SPIE Conference on Optical Trapping and Optical Micromanipulation XXI (San Diego, CA, August 2024) "Active matter crystals and solitons on optical periodic substrates."

Seminars and Colloquia – International

79. McMaster University, Theoretical Physics Group seminar (Hamilton, Ontario, March 1998); "Dynamic phases in superconductors with periodic pinning arrays."

80. Universität Konstanz, Physics seminar (Konstanz, Germany, April 2002); "Static and dynamic colloidal states on patterned substrates."

81. University of Stuttgart, Physics seminar (Stuttgart, Germany, September 2003); "Equilibrium and non-equilibrium studies of colloids using computer simulations."

82. University of Antwerp (Campus Drie Eiken), Physics seminar (Antwerp, Belgium, June 2004); "Crystallization, melting and jamming in soft matter systems with external fields."

83. University of Ljubljana, Physics colloquium (Ljubljana, Slovenia, November 2005); "Colloids in external fields: Crystallization, melting, and dynamics."

84. Ludwig Maximilian University, Physics seminar (Munich, Germany, November 2005); "Colloids in external fields: Crystallization, melting, and dynamics."

85. University of Düsseldorf, Physics seminar (Düsseldorf, Germany, November 2005); "Colloids in external fields: Crystallization, melting, and dynamics."

86. St. Andrews University, Physics Colloquium (St. Andrews, United Kingdom, October 2007); "Colloids as a model system to explore complex matter."

87. University of Manchester, Theoretical Physics seminar (Manchester, United Kingdom, November 2007); "Colloids as a model system to explore complex matter."

88. Imperial College, Applied Mathematics seminar (London, United Kingdom, November 2007); "Colloids as a model system to explore complex matter."

Seminars and Colloquia – International (Cont.)

89. University of Bath, Nanoscience seminar (Bath, United Kingdom, November 2007); "Colloids as a model system to explore complex matter."

90. Oxford University, Theoretical Physics seminar (Oxford, United Kingdom, November 2007); "Colloids as a model system to explore complex matter."

91. University of Tsukuba, Institute of Materials Science seminar (Tsukuba, Japan, April 2008); "Reversible and irreversible flow transitions of vortex matter in superconductors."

92. University of Tokyo, Department of Basic Science seminar (Tokyo, Japan, April 2008); "Reversible and irreversible flow transitions of vortex matter in superconductors."

93. Tokyo Institute of Technology, Research Center for Low Temperature Physics seminar (Tokyo, Japan, April 2008); "Reversible and irreversible flow transitions of vortex matter in superconductors."

94. University of Tübingen, Physics seminar (Tübingen, Germany, April 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

95. Vrije University, Physics seminar (Amsterdam, The Netherlands, April 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

96. University of Antwerp, Physics seminar (Antwerp, The Netherlands, April 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

97. Catholic University Leuven, Physics seminar (Leuven, Belgium, April 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

98. University of Barcelona, Physical Chemistry seminar (Barcelona, Spain, May 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

99. Budapest University of Technology and Economics, Department of Theoretical Physics seminar (Budapest, Hungary, April 2010); "Local probes of melting, decoupling, and jamming transitions."

100. Hungarian Academy of Sciences, Research Institute for Solid State Physics and Optics Seminar (Budapest, Hungary, April 2010); "Local probes of melting, decoupling, and jamming transitions."

101. Eotvos Lorand University, Department of Biological Physics Seminar (Budapest, Hungary, April 2010); "Computational modeling of directed motion in self-driven systems such as bacteria and cells."

102. Babeş-Bolyai University, Physics colloquium (Cluj-Napoca, Romania, April 2010); "Computational modeling of directed motion in self-driven systems such as bacteria and cells."

103. Babeş-Bolyai University, Physics colloquium (Cluj-Napoca, Romania, April 2010); "Local probes of melting, decoupling, and jamming transitions."

104. Umea University, Department of Physics seminar (Umea, Sweden, January 2011); "Local probes of melting, decoupling, and jamming transitions."

Seminars and Colloquia – International (Cont.)

105. Universidad Autonoma de Madrid, Department of Physics seminar (Madrid, Spain, January 2011); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

106. University of Oslo, Department of Physics seminar (Oslo, Norway, January 2011); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

107. Uppsala University, Department of Physics seminar (Uppsala, Sweden, May 2012); "Statics and dynamics of artificial spin ice."

108. Uppsala University, Department of Physics seminar (Uppsala, Sweden, May 2012); "Jamming, clogging, and depinning in systems with random and periodic substrates."

109. National University of Singapore, Department of Physics seminar (Singapore, June 2012); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

110. Nanyang Technological University, Department of Physics seminar (Singapore, June 2012); "Pattern formation from competing interactions: Implications for soft and hard condensed matter systems."

111. Indian Institute of Technology–Kanpur, Department of Physics seminar (Kanpur, India, November 2012); "Jamming, clogging, and depinning in systems with quenched disorder."

112. Tata Institute of Fundamental Research, seminar (Mumbai, India, December 2012); "Jamming, clogging, and depinning in systems with quenched disorder."

113. University of Stuttgart, Department of Physics seminar (Stuttgart, Germany, February 2013); "Jamming, clogging, and depinning in systems with quenched disorder."

114. University of Leeds, Department of Physics seminar (Leeds, United Kingdom, January 2014); "Statics and dynamics of artificial spin ice."

115. CNRS/Thales Universite Paris-Sud Campus de Polytechnique, Unite Mixte de Physique seminar (Palaiseau Cedex, France, April 2014); "Superconducting vortices and skyrmions in random and periodic pinning arrays."

116. Universidad Complutense de Madrid, Department of Materials Physics seminar (Madrid, Spain, September 2014); "Skyrmion lattices in random and ordered potential landscapes."

117. University of Cologne, Institute for Theoretical Physics seminar (Cologne, Germany, September 2014); "Skyrmion lattices in random and ordered potential landscapes."

118. Weizmann Institute of Science, Condensed Matter Physics seminar (Rehovot, Israel, October 2014); "Skyrmion lattices in random and ordered potential landscapes."

119. Technion–Israel Institute of Technology, Solid State seminar (Haifa, Israel, November 2014); "Skyrmion lattices in random and ordered potential landscapes."

Seminars and Colloquia – International (Cont.)

120. Bar-Ilan University, Condensed Matter Resnick seminar (Ramat-Gan, Israel, November 2014); "Skyrmion lattices in random and ordered potential landscapes."

121. Ben-Gurion University, Physics colloquium (Be'er Sheva, Israel, November 2014); "Skyrmion lattices in random and ordered potential landscapes."

122. Bilkent University, Physics colloquium (Ankara, Turkey, November 2014); "Jamming and clogging transitions in driven systems in the presence of obstacle arrays."

123. Tokyo Institute of Technology, Physics seminar (Tokyo, Japan, November 2015); "Reversible avalanches and criticality in amorphous solids."

124. University of Tokyo, Applied Physics seminar (Tokyo, Japan, November 2015); "Nonequilibrium dynamics of skyrmion lattices in random and ordered substrates."

125. RIKEN, seminar (Saitama, Japan, November 2015); "Nonequilibrium dynamics of skyrmion lattices in random and ordered substrates."

126. University College London, Chemistry seminar (London, United Kingdom, April 2016); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

127. Soochow University, Physics seminar (Suzhou, China, January 2017); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

128. The Hong Kong University of Science and Technology, Physics seminar (Pokfulam, Hong Kong, January 2017); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

129. National Chiao Tung University, Department of Electrophysics seminar (Hsinchu City, Taiwan, January 2017); "Statics and dynamics of skyrmions in random and ordered potential landscapes."

130. Sapienza University of Rome, Physics Active Matter Group seminar (Rome, Italy, March 2017); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

131. University of Naples Federico II, Physics seminar (Naples, Italy, March 2017); "Statics and dynamics of skyrmions in random and ordered potential landscapes."

132. University of Paris VI, Laboratore de Physique Theorique de la Mateiere Condensee seminar (Paris, France, May 2017) "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

133. University of Barcelona, Physics seminar (Barcelona, Spain, May 2017); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

134. Universidad de Navarra, Physics seminar (Pamplona, Spain, June 2017); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

Seminars and Colloquia – International (Cont.)

135. University of Innsbruck, Physics seminar (Innsbruck, Austria, February 2019); "Skyrmion lattices in random and ordered potential landscapes."

136. University of Konstanz, Physics seminar (Konstanz, Germany, February 2019); "Jamming and clogging of passive and active particles in disordered media."

137. Johannes Gutenberg University of Mainz, Physics seminar (Mainz, Germany, February 2019); "Skyrmion lattices in random and ordered potential landscapes."

138. Instituto Balseiro, Physics colloquium (Bariloche, Argentina, June 2019); "Skyrmions in chiral magnets, liquid crystals and beyond."

139. University of Antwerp, Physics seminar (Antwerp, Belgium, October 2019); "Skyrmions in chiral magnets, liquid crystals and beyond."

140. University of Liege, Physics seminar (Liege, Belgium, September 2022); "Clogging, dynamics and epidemic spreading for active matter on complex environments."

141. University of Antwerp, Physics seminar (Antwerp, Belgium, September 2022); "Kibble-Zurek mechanism for nonequilibrium phase transitions in driven systems with quenched disorder."

142. University of Konstanz, Physics colloquium (Konstanz, Germany, June 2023); "Active matter spin ice."

143. University of Gothenburg, Physics seminar (Gothenburg, Sweden, Nov 2023); "Complex Dynamics in Active Matter Systems, Frustration Effects, Magnus Forces and Synchronization."

144. University of Luxembourg, Physics seminar (Luxembourg, Dec 2023); "Kibble-Zurek mechanism for nonequilibrium phase transitions in driven systems with quenched disorder."

145. University of Luxembourg, Physics colloquium (Luxembourg, Dec 2023); "Complex Dynamics in Active Matter Systems, Frustration Effects, Magnus Forces and Synchronization."

146. University of Duisburg-Essen, Physics seminar (Duisburg, Germany, Dec 2023); "Dynamics of Chiral Systems, Vortices, Skyrmions, and Active Matter."

147. University of Düsseldorf, Physics seminar (Düsseldorf, Germany, Dec 2023); "Complex Dynamics in Active Matter Systems, Frustration Effects, Magnus Forces and Synchronization."

148. Tokyo Institute of Technology, Physics seminar (Tokyo, Japan, Apr 2024); "Kibble-Zurek mechanism for nonequilibrium phase transitions in driven systems with quenched disorder."

149. Waseda University, Physics seminar (Tokyo, Japan, Apr 2024); "Dynamics of chiral systems, vortices, skyrmions, and active matter."

150. University of Tokyo, Physics seminar (Tokyo, Japan, Apr 2024); "Complex dynamics in active matter systems, frustration effects, Magnus forces and synchronization."

Seminars and Colloquia – Domestic

151. Argonne National Laboratory, Vortex Group seminar (Argonne, IL, October 1997); "Commensurate and incommensurate vortex states in superconductors with periodic pinning arrays."

152. University of Missouri–Rolla, Physics Department colloquium (Rolla, MO, March 2000); "Static and dynamic phases of vortex matter in superconductors with nanostructured arrays."

153. Rensselaer Polytechnic Institute, Physics Department seminar (Troy, NY, March 2000); "Static and dynamic phases of vortex matter in superconductors with nanostructured arrays."

154. Worcester Polytechnic University, Physics Department colloquium (Worcester, MA, March 2001); "Static and dynamic phases of vortex matter in nanostructured arrays."

155. Los Alamos National Laboratory, Center for Nonlinear Studies seminar (Los Alamos, NM, April 2001); "Ordering and dynamics of vortices and colloids on periodic substrates."

156. University of Wisconsin–Madison, Applied Superconductivity Center seminar (Madison, WI, June 2001); "Static and dynamic vortex states in layered superconductors."

157. Argonne National Laboratory, Materials Science Division seminar (Argonne, IL, July 2001); "Ordering and dynamics of vortices and colloids on periodic substrates."

158. New Mexico State University, Physics colloquium (Las Cruces, NM, January 2002); "Static and dynamic colloidal states on patterned substrates."

159. Emory University, Physics colloquium (Atlanta, GA, February 2002); "Static and dynamic colloidal states on patterned substrates."

160. Wesleyan University, Physics colloquium (Middletown, CT, March 2002); "Static and dynamic colloidal states on patterned substrates."

161. California Institute of Technology, Condensed Matter seminar (Pasadena, CA, May 2002); "Dynamics and melting of stripes, bubbles, and crystals with quenched disorder."

162. University of California–Davis, Condensed Matter seminar (Davis, CA, May 2002); "Dynamics and melting of stripes, bubbles, and crystals with quenched disorder."

163. Los Alamos National Laboratory, Center for Nonlinear Studies seminar (Los Alamos, NM, May 2002); "Dynamics and melting of stripes, bubbles, and crystals with quenched disorder."

164. Argonne National Laboratory, Materials Science Division seminar (Argonne, IL, June 2002); "Static and dynamic colloidal states on patterned substrates."

165. University of Missouri–Columbia, Physics colloquium (Columbia, MO, November 2002); "Novel colloidal states on patterned substrates."

166. University of Notre Dame, Condensed Matter seminar (Notre Dame, IN, November 2002); "Novel colloidal states on patterned substrates."

Seminars and Colloquia – Domestic (Cont.)

167. North Dakota State University, Physics Department colloquium (Fargo, ND, January 2003); "Static and dynamic colloidal states on patterned substrates."

168. Los Alamos National Laboratory, Condensed Matter and Statistical Physics seminar (Los Alamos, NM, February 2003); "Static and dynamic colloidal states on patterned substrates."

169. Oregon State University, Physics colloquium (Corvallis, OR, March 2003); "Investigating static and dynamic colloidal states using computer simulations."

170. Oregon State University, Solid State seminar (Corvallis, OR, March 2003); "Dynamics in superconducting and metallic nanostructures."

171. Los Alamos National Laboratory, Center for Nonlinear Studies seminar (Los Alamos, NM, April 2003); "Dynamical states in superconducting and metallic nanostructures."

172. University of Arizona, Physics colloquium (Tucson, AZ, January 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

173. University of California–Irvine, Condensed Matter Physics seminar (Irvine, CA, April 2004); "Crystallization, melting and jamming in soft matter systems with external fields."

174. University of California–Davis, Condensed Matter Physics seminar (Davis, CA, May 2004); "Pattern formation in systems with competing interactions: applications to materials science."

175. University of Chicago, Materials Research Center seminar (Chicago, IL, May 2004); "Pattern formation in systems with competing interactions: applications to materials science."

176. Michigan State University, Condensed Matter Physics seminar (Lansing, MI, May 2004); "Crystallization, melting and jamming in soft matter systems with external fields."

177. Los Alamos National Laboratory, Center for Nonlinear Studies seminar (Los Alamos, NM, August 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

178. Iowa State University, Condensed Matter Physics seminar (Ames, IA, September 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

179. University of Iowa, Physics colloquium (Iowa City, IA, September 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

180. Brandeis University, Condensed Matter Physics seminar (Waltham, MA, October 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

181. University of Florida, Condensed Matter Physics seminar (Gainsville, FL, October 2004); "Pattern formation in systems with competing interactions: Superconductors, stripes, and checkerboards."

182. University of Central Florida, Condensed Matter Physics seminar (Orlando, FL, October 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

Seminars and Colloquia – Domestic (Cont.)

183. Florida State University, Condensed Matter Physics seminar (Tallahassee, FL, October 2004); "Pattern formation in systems with competing interactions: Superconductors, stripes, and checkerboards."

184. Syracuse University, Condensed Matter Physics seminar (Syracuse, NY, November 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

185. New York University, Condensed Matter Physics seminar (New York, NY, November 2004); "Equilibrium and nonequilibrium states for colloids interacting with external fields."

186. University of Colorado–Boulder, Condensed Matter Physics seminar (Boulder, CO, January 2005); "Crystallization, melting, and jamming in colloidal systems with external fields."

187. Colorado State University, Physics colloquium (Fort Collins, CO, January 2005); "Crystallization, melting, and jamming in colloidal systems with external fields."

188. Vanderbilt University, Physics colloquium (Nashville, TN, January 2005); "Crystallization, melting, and jamming in colloidal systems with external fields."

189. Vanderbilt University, Condensed Matter Physics seminar (Nashville, TN, January 2005); "Transport and devices in nanoscale superconductors and metallic dot arrays."

190. University of Minnesota, Condensed Matter Physics seminar (Minneapolis, MN, February 2005); "Crystallization, melting, and jamming in colloidal systems with external fields."

191. Los Alamos National Laboratory, Center for Nonlinear Studies External Advisory Committee Meeting (Los Alamos, NM, February 2005); "Colloidal molecular crystals."

192. Los Alamos National Laboratory, T-11 seminar (Los Alamos, NM, April 2005); "Charge ordering, heterogeneities, and noise: Implications for the 2D metal-insulator transition and superconductivity."

193. Indiana University, Condensed Matter Physics seminar (Bloomington, IN, April 2005); "Pattern formation in systems with competing interactions: Stripes, checkerboards, and bubbles."

194. Virginia Tech, Condensed Matter Physics seminar (Blacksburg, VA, October 2005); "Colloids in external fields: Crystallization, melting, and dynamics."

195. Harvard University, Applied Science seminar (Cambridge, MA, October 2005); "Colloids in external fields: Crystallization, melting, and dynamics."

196. Yale University, Mechanical Engineering seminar (New Haven, CT, October 2005); "Colloids in external fields: Crystallization, melting, and dynamics."

197. Wayne State University, Physics colloquium (Detroit, MI, February 2006); "Colloids in external fields: Crystallization, melting, and dynamics."

198. Florida State University, Condensed Matter Physics seminar (Tallahassee, FL, February 2006); "Colloids in external fields: Crystallization, melting, and dynamics."

Seminars and Colloquia – Domestic (Cont.)

199. University of Massachusetts–Amherst, Condensed Matter Physics seminar (Amherst, MA, March 2006); "Colloids in external fields: Crystallization, melting, and dynamics."

200. University of Houston, Condensed Matter Physics seminar (Houston, TX, April 2006); "Colloids in external fields: Crystallization, melting, and dynamics."

201. Louisiana State University, Materials Science and Engineering seminar (Baton Rouge, LA, April 2006); "Pattern formation in systems with competing interactions: Stripes, checkerboards, and bubbles."

202. Los Alamos National Laboratory, T-16 (Nuclear Physics) seminar (Los Alamos, NM, May 2006); "Condensed matter physics models for molecular and nuclear physics."

203. Northwestern University, Physics Department seminar (Evanston, IL, May 2006); "Pattern formation in systems with competing interactions: Stripes, checkerboards, and bubbles."

204. University of California–Davis, Condensed Matter Physics seminar (Davis, CA, October 2006); "Colloids as a model system to explore complex matter."

205. University of California–Santa Cruz, Condensed Matter Physics seminar (Santa Cruz, CA, October 2006); "Colloids as a model system to explore complex matter."

206. University of California–Los Angeles, Chemistry seminar (Los Angeles, CA, October 2006); "Colloids as a model system to explore complex matter."

207. University of California–Riverside, Condensed Matter Physics seminar (Riverside, CA, October 2006); "Colloids as a model system to explore complex matter."

208. University of Southern California, Condensed Matter Physics seminar (Los Angeles, CA, October 2006); "Colloids as a model system to explore complex matter."

209. University of Rochester, Condensed Matter Physics seminar (Rochester, NY, February 2007); "Colloids as a model system to explore complex matter."

210. Cornell University, Physics seminar (Ithaca, NY, February 2007); "Colloids as a model system to explore complex matter."

211. Rensselaer Polytechnic Institute, Physics colloquium (Troy, NY, February 2007); "Colloids as a model system to explore complex matter."

212. University of Pittsburgh, Condensed Matter Physics seminar (Pittsburgh, PA, October 2007); "Colloids as a model system to explore complex matter."

213. Washington University, Condensed Matter Physics seminar (St. Louis, MO, October 2007); "Colloids as a model system to explore complex matter."

214. Los Alamos National Laboratory, Center for Nonlinear Studies seminar (Los Alamos, NM, December 2007); "Swimming bacteria and Maxwell's demon."

Seminars and Colloquia – Domestic (Cont.)

215. Washington State University, Physics colloquium (Pullman, WA, January 2008); "Colloids as a model system to explore complex matter with competing interactions."

216. University of Idaho, Physics colloquium (Moscow, ID, February 2008); "Colloids as a model system to explore complex matter with competing interactions."

217. Old Dominion University, Physics colloquium (Norfolk, VA, March 2008); "Colloids as a model system to explore complex matter with competing interactions."

218. Los Alamos National Laboratory, Center for Nonlinear Studies seminar (Los Alamos, NM, May 2008); "Nonequilibrium phase transitions and jamming for reversible and irreversible dynamics in many-particle systems."

219. Kent State University, Liquid Crystal Institute seminar (Kent, OH, January 2009); "Using colloids to explore complex matter with competing interactions."

220. Los Alamos National Laboratory, Condensed Matter and Complex Systems seminar (Los Alamos, NM, May 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

221. University of New Mexico–Los Alamos, Los Alamos Summer School Program Lecture (Los Alamos, NM, June 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

222. Los Alamos National Laboratory, Center for Nonlinear Studies seminar (Los Alamos, NM, July 2009); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

223. Duke University, Physics colloquium (Durham, SC, February 2010); "Using colloids to explore complex matter with competing interactions."

224. Duke University, Center for Theoretical and Mathematical Sciences seminar (Durham, SC, February 2010); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

225. University of Pennsylvania, Department of Physics seminar (Philadelphia, PA, April 2012); "Jamming and clogging transitions for systems with quenched disorder."

226. Temple University, Department of Physics seminar (Philadelphia, PA, April 2012); "Jamming and clogging transitions for systems with quenched disorder."

227. Pennsylvania State University, Department of Physics seminar (University Park, PA, April 2012); "Jamming and clogging transitions for systems with quenched disorder."

228. Los Alamos National Laboratory, T-4 seminar (Los Alamos, NM, September 2012); "Jamming, clogging, and depinning in systems with random and periodic substrates."

Seminars and Colloquia – Domestic (Cont.)

229. University of Illinois at Urbana-Champaign, Institute for Condensed Matter Theory seminar (Urbana-Champaign, IL, February 2013); "Pattern formation for competing interactions: Implications for soft and hard condensed matter systems."

230. Argonne National Laboratory, Materials Science Division seminar (Argonne, IL, February 2013); "Jamming, clogging, and depinning in systems with quenched disorder."

231. Northern Illinois University, Department of Physics colloquium (Chicago, IL, February 2013); "Jamming, clogging, and depinning in systems with quenched disorder."

232. University of California–Merced, Department of Physics seminar (Merced, CA, April 2013); "Jamming, clogging, and depinning in systems with quenched disorder."

233. University of California–Davis, Department of Physics seminar (Davis, CA, April 2013); "Jamming, clogging, and depinning in systems with quenched disorder."

234. New York University, Department of Physics seminar (New York, NY, April 2013); "The transition to irreversibility in sheared amorphous solids."

235. Princeton University, Department of Physics seminar (Princeton, NJ, April 2013); "Realizing novel collective particle dynamics on periodic substrates: From superconductors to bacteria."

236. University of California–San Diego, Department of Physics seminar (San Diego, CA, October 2013); "Skyrmion dynamics in chiral magnets."

237. University of California–Irvine, Department of Physics seminar (Irvine, CA, October 2013); "Skyrmion dynamics in chiral magnets."

238. Syracuse University, Condensed Matter and Biological Physics seminar (Syracuse, NY, November 2013); "Self-organization, fluctuation forces and transport of active matter on disordered landscapes."

239. Brandeis University, MRSEC seminar (Waltham, MA, November 2013); "Self-organization, fluctuation forces and transport of active matter on disordered landscapes."

240. Los Alamos National Laboratory, T-4 Physics of Condensed Matter and Complex Systems seminar (Los Alamos, NM, December 2013); "Self-organization, fluctuation forces and transport of active matter on disordered landscapes."

241. Washington University, Condensed Matter seminar (St. Louis, MO, January 2014); "Self-organization, fluctuation forces and transport of active matter on disordered landscapes."

242. Boston College, Physics seminar (Chestnut Hill, MA, January 2015); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

243. Harvard University, Widely Applied Mathematics seminar (Cambridge, MA, January 2015); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

244. University of Massachusetts - Boston, Physics colloquium (Boston, MA, January 2015); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

Seminars and Colloquia – Domestic (Cont.)

245. Yale University, Mechanical Engineering and Materials Science seminar (New Haven, CT, January 2015); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

246. Los Alamos National Laboratory, T-4 Physics of Condensed Matter and Complex Systems seminar (Los Alamos, NM, July 2015); "Nonequilibrium dynamics of skyrmion lattices in random and ordered substrates."

247. Argonne National Laboratory, Materials Science Division seminar (Argonne, IL, February 2016); "Statics and dynamics of skyrmions in random and ordered potential landscapes."

248. University of Notre Dame, Condensed Matter and Biophysics seminar (Notre Dame, IN, February 2016); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

249. Los Alamos National Laboratory, T-4 Physics of Condensed Matter and Complex Systems seminar (Los Alamos, NM, November 2016); "The dynamics of active matter particles in complex environments."

250. University of New Hampshire, Physics colloquium (Durham, NH, March 2017); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

251. West Virginia University, Mechanical and Aerospace Engineering seminar (Morgantown, WV, March 2017); "The dynamics of active matter particles on disordered landscapes: Jamming, clogging, and avalanches."

252. Virginia Tech, Physics seminar (Blacksburg, VA, October 2017); "Skyrmion lattices in random and ordered potential landscapes."

253. University of Virginia, Condensed Matter seminar (Charlottesville, VA, October 2017); "Skyrmion lattices in random and ordered potential landscapes."

254. Colorado School of Mines, Physics seminar (Golden, CO, November 2017); "Skyrmion lattices in random and ordered potential landscapes."

255. University of Colorado - Boulder, Condensed Matter seminar (Boulder, CO, November 2017); "Skyrmion lattices in random and ordered potential landscapes."

252. Los Alamos National Laboratory, T-4 Physics of Condensed Matter and Complex Systems seminar (Los Alamos, NM, October 2018); "Skyrmion Hall effect, avalanches and clustering."

253. University of New Hampshire, Materials Science seminar (Durham, NH, September 2022); "Clogging, dynamics, and epidemic spreading for active matter on complex environments."

254. Los Alamos National Laboratory, T-4 Physics of Condensed Matter and Complex Systems seminar (Los Alamos, NM, February 2024); "Dynamics of Chiral Systems, Vortices, Skyrmions, and Active Matter."

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