RESUME

Dr. Orion Ciftja
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Education

- **Ph.D.** - International School of Advanced Studies (SISSA/ISAS), Trieste, Italy, **1997**
- **Master Phil** - International School of Advanced Studies (SISSA/ISAS), Trieste, Italy, **1995**
- **Diploma ICTP Degree** - International Centre for Theoretical Physics (ICTP), Trieste, Italy, **1994**
- **Diploma Degree -** University of Tirana, Tirana, Albania, **1991**

Teaching Experience

- **Associate Professor**, Department of Physics, Prairie View A&M University (PVAMU), Prairie View, Texas 77446, USA **(2008-present)**
- **Assistant Professor**, Department of Physics, Prairie View A&M University (PVAMU), Prairie View, Texas 77446, USA **(2002-2008)**
- **Visiting Assistant Professor**, Department of Physics, Texas A&M University, College Station, Texas 77843, USA **(1999-2000)**
- **Assistant Professor**, Department of Physics, University of Tirana, Albania **(1991-1993)**

Research Experience

- **Assistant/Associate Professor**, Department of Physics, Prairie View A&M University, Prairie View, Texas 77446, USA **(2002-present)**
- **Post-Doctoral Fellow**, Department of Physics & Astronomy, University of Missouri, Columbia, Missouri 65211, USA **(2000-2002)**
- **Visiting Assistant Professor**, Department of Physics, Texas A&M University, College Station, Texas 77843, USA **(1999-2000)**
- **Post-Doctoral Fellow**, Ames Laboratory, Iowa State University, Ames, Iowa 50011, USA **(1997-1999)**
- **Guest Scientist,** International Centre for Theoretical Physics (ICTP), Trieste, Italy **(October 1, 1994-December 31, 1994)**

Academic and Professional Service

- Member of many Departmental, College and University Committees
- Regular Member of the American Physical Society (APS)
- Academy Member of the TAMU System's Academy for Educator Development
- Reviewer/Referee of international Physics journals: Physical Review Letters, Physical Review B, Physical Review E, Journal of Physics B, Journal of Physics D, Journal of Physics: Condensed Matter, Physics Letters A, Optics Communications, Physica Status Solidi (b), etc
- Panel Reviewer for National Science Foundation (NSF)
- Book Reviewer (two textbooks)

- Co-Advisor of the Society of Physics Students (SPS) local Chapter
- Host/Coordinator of campus/department activities

Recent Honors/Awards

- **Kavli Institute for Theoretical Physics (KITP) Scholar for the period 2007-2009**. On the congratulating letter accompanying the Award Certificate [dated December 15, 2006], Dr. David Gross, Director and 2004 Nobel Prize Winner in Physics remarks: *"The selection committee was very impressed with your application and we look forward to your association with the KITP…"*
- **PVAMU-Department of Physics Citation,** December 8, 2006 "In recognition of being the most prolific publisher of scientific papers in internationally refereed journals and for his work on the newsletter preview"

Areas of Research Interests

- **Strongly correlated electrons and the fractional quantum Hall effect:** The experimental realization of almost ideal two-dimensional (2D) electronic systems opened new frontiers in condensed matter physics and resulted in many discoveries such as the fractional quantum Hall effect (FQHE). The FQHE represents a novel state of matter that arises from strong electronic correlations. When upper Landau levels are half filled, it was believed that a Fermi liquid-like state is stable. Recent experiments around half filling of the upper Landau levels have shown surprisingly very strong magneto-transport anisotropies below a critical temperature of about 100 mK. Rather than adopt the conventional charge density wave approach, one can view the onset of anisotropy as signature of a phase transition to an anisotropic electronic liquid crystalline state with broken rotational symmetry. Over the last few years, I have worked on the formulation of a general theory of liquid crystalline electronic systems and the understanding of the origin the anisotropy in such systems.
- **Monte Carlo algorithms for solving many-body problems:** Monte Carlo methods for solving the many-body Schrödinger equation have been widely applied to the study of quantum systems as diverse as liquid and solid helium, electron gas and small molecules. Will the increasing availability of supercomputers, this trend will undoubtedly continue. Fundamental improvements in Monte Carlo algorithms are needed in order to significantly affect many areas of research simultaneously. I have worked to implement second and fourth order Monte Carlo simulation algorithms to study liquid and solid He4 using the shadow wave function formalism. Results on Bose systems have been very encouraging. My near future interest is to extend such algorithms to Fermi systems.
- **Two-dimensional semiconductor quantum dots:** Quantum dots are semiconductor devices consisting of electrons confined in a small region of space, usually in two dimensions. The interplay between quantum confinement, magnetic field and charging effects manifests itself in many complex physical phenomena. Current studies have thoroughly investigated the interplay between confinement, magnetic field and electronic correlations. Less work is done to understand the impact of these factors on the spin of electrons spins which is important for the area of spintronics/quantum computing. During the last years, I have worked to understand the properties of small semiconductor quantum dots. My future interest is to study a reliable spin readout (control) mechanism in small single or laterally coupled quantum dots. Absence of such mechanism has severely slowed down progress in the field.
- **Molecular magnetism:** With the successful synthesis of a plethora of complex magnetic organic molecules, coordination chemistry has brought forth a new class of nanometer-size magnetic materials. To date, chemists have successfully synthesized magnetic molecules in which are embedded as few as two and as many as thirty interacting magnetic ions. These systems are distinctive because the magnetic interactions can be modified in a controlled way using ligand substitution, or by variation of magnetic

ion species determining the magnitude of the individual spins. One can thus explore the range from (small) quantum spins to essentially large (classical) spins in a controlled manner. My work has been on modeling the spin dynamics and understanding various quantum spin effects on such nanoscale systems.

Funded Projects (PI or Co-PI)

- Anisotropy in Correlated Electronic Systems in Quantum Hall Regime, **National Science Foundation**, $138,000, September 15, 2008 – August 31, 2011
- Acquisition of a dilution refrigerator with tunnel diode system, **National Science Fondation**, $321,173, October 1, 2006-September 30, 2009
- IGERT: New mathematical tools for next generation materials [Leading Institution: TAMU; Participating Institutions: PVAMU and Texas State University], **National Science Fondation**, $2,800,000, June 1, 2006-May 31, 2011
- Research on the actinides and related materials at extreme conditions, **Department of Energy**, $1,500,000, October 1, 2005-September 30, 2007
- Physics of nanotechnology at PVAMU, **Research Enhancement Program**, $3500, September 1, 2003-August 31, 2004

Thesis and Student Supervisor

- M.S. Thesis Supervisor **(2003-2005)** [M. Golam Faruk, Department of Electrical Engineering]
- Supervisor of three undergraduate students **(2005-2007)** [Terrea Anderson (3 months), Magine Rideau and Brandon McGlaston]

Invited Talks and Conference Proceedings
(Since January 1, 1996)

More than 40 (forty) invited talks/seminars/colloquiums/presentations [at Iowa State University, Harvard University, Ames Laboratory, Argonne National Laboratory, University of Notre Dame, Rice University, TAMU - College Station, UT - Dallas, University of Houston, University of Missouri - Columbia etc]
(Full list provided upon request)

Selected Refereed Publications
(Papers/Presentations/Proceedings that are **not peer-reviewed** are **not included!**)
(Since January 1, 1996)

1. O. Ciftja, *Lamellar-like structures in ferrofluids placed in strong magnetic fields*, **Solid State Communications 149, 532 (2009).**
2. O. Ciftja, *Exact results for systems of electrons in the fractional quantum Hall regime,* **Physica B 404, 227 (2009).**
3. O. Ciftja, *Few-electrons semiconductor quantum dots in magnetic field*, **Physica Status Solidi (c) 6, 825 (2009).**
4. O. Ciftja, M. Rideau and B. McGlaston, *Two-dimensional motion of a parabolically confined charged particle in a perpendicular magnetic field*, **submitted to American Journal of Physics (2008).**
5. O. Ciftja and C. Wexler, *Anisotropy in two-dimensional electronic quantum Hall systems at half filling of valence Landau levels*, **Physica B 403, 1511 (2008).**
6. O. Ciftja, *Spin dynamics of an ultra-small nanoscale molecular magnet,* **Nanoscale Res Lett 2:168-174 (2007).**

7. O. Ciftja, *An experimentally justified confining potential for electrons in two-dimensional semiconductor quantum dots*, **J Computer-Aided Mater Des 14:37-44 (2007).**
8. O. Ciftja, *Generalized description of few-electron quantum dots at ero and nonzero magnetic field*, **J. Phys.: Condens. Matter 19, 046220 (2007).**
9. O. Ciftja, *Solution of the stationary Schrodinger's differential equation for a delta-split harmonic oscillator using the numerical diagonalization technique*, **Dynamics of Continuous Discrete and Impulsive Systems - Series A – Mathematical Analysis 13: 367-376 Suppl. S, Oct (2006).**
10. O. Ciftja, *Monte Carlo study of Bose Laughlin wave function for filling factors 1/2, 1/4 and 1/6*, **Europhys. Lett. 74(3), 486 (2006).**
11. C. Wexler and O. Ciftja, *Novel liquid crystalline phases in quantum Hall systems*, **Int. J. Mod. Phys. B 20, 747 (2006). [Review Article]**
12. O. Ciftja and M. G. Faruk, *Two interacting electrons in a one-dimensional quantum dot: Exact numerical diagonalization*, **J. Phys.: Condens. Matter 18, 2623 (2006).**
13. O. Ciftja and M. G. Faruk, *Two-dimensional quantum-dot helium in a magnetic field: Variational theory*, **Phys. Rev. B 72, 205334 (2005).**
14. O. Ciftja, G. S. Japaridze and X. Q. Wang, *An anyon wavefunction for the fractional quantum Hall effect*, **J. Phys.: Condens. Matter 17, 2977 (2005).**
15. O. Ciftja and A. A. Kumar, *Ground state of two-dimensional quantum-dot helium in zero magnetic field: perturbation, diagonalization and variational theory,* **Phys. Rev. B 70, 205326 (2004).**
16. O. Ciftja, C. M. Lapilli, and C. Wexler, *Liquid crystalline states for two-dimensional electrons in strong magnetic fields*, **Phys. Rev. B 69, 125320 (2004).**
17. O. Ciftja and S. A. Chin, *Short-time-evolved wave functions for solving quantum many-body problems,* **Phys. Rev. B 68, 134510 (2003).**
18. A.J. Schmidt, O. Ciftja and C. Wexler, *Trial state for a two-dimensional hexatic,* **Phys. Rev. B 67, 155315 (2003).**
19. O. Ciftja and C. Wexler, *Monte Carlo simulation method for Laughlin-like states in a disk geometry,* **Phys. Rev. B 67, 075304 (2003).**
20. C. Wexler and O. Ciftja, *Liquid crystalline states in quantum Hall systems*, **J. Phys.: Condens. Matter 14, 3705 (2002).**
21. O. Ciftja and C. Wexler, *Fermi hypernetted-chain study of half-filled Landau levels with broken rotational symmetry*, **Phys. Rev. B 65, 205307 (2002).**
22. O. Ciftja and C. Wexler, *Coulomb energy of quasiparticle excitations in Chern-Simons composite fermion states*, **Solid State Commun. 122/7-8, 401 (2002).**
23. O. Ciftja and C. Wexler, *Hypernetted-chain study of broken rotational symmetry states for the v=1/3 fractional quantum Hall effect and other fractionally filled Landau levels*, **Phys. Rev. B 65, 045306 (2002).**
24. O. Ciftja and C. Wexler, *Energy gaps for fractional quantum Hall states described by a Chern-Simons composite fermion wavefunction*, **Eur. Phys. J. B 23, 437 (2001).**
25. O. Ciftja, Siu. A. Chin and F. Pederiva, *He^4 shadow wave function with an inverse seventh power particle-particle correlation function*, **J. Low. Temp. Phys.122 (5/6), 605 (2001).**
26. O. Ciftja, *The irregular tetrahedron of classical and quantum spins subjected to a magnetic field*, **J. Phys. A: Math. Gen. 34, 1611 (2001).**
27. O. Ciftja, S. Moroni and S. Fantoni, *The coherent-state wave function for solid ^3He*, **J. Phys. Condens. Matter 13, 1041 (2001).**
28. O. Ciftja, *Theoretical estimates for the correlation energy of the unprojected composite fermion wavefunction*, **Physica E 9, 226 (2001).**
29. O. Ciftja, *Spin correlation functions of some frustrated ultra-small classical Heisenberg clusters*, **Physica A 286, 541 (2000).**

30. O. Ciftja, *The Fermi-sea-like limit of the composite fermion wave function*, **Eur. Phys. J. B 13, 671 (2000).**
31. O. Ciftja, *A simple derivation of the exact wavefunction of a harmonic Oscillator with time-dependent mass and frequency*, **J. Phys. A: Math. Gen. 32, 6385 (1999).**
32. O. Ciftja, M. Luban, M. Auslander and J.H. Luscombe, *Equation of state and spin-correlation functions of ultra-small classical Heisenberg magnets*, **Phys. Rev. B 60 (14), 10122 (1999).**
33. O. Ciftja, *Effective hypernetted-chain study of even-denominator-filling state of the fractional quantum Hall effect*, **Phys. Rev. B 59 (15), 10194 (1999).**
34. O. Ciftja , *Exact results for a composite fermion wave function*, **Phys. Rev. B 59 (12), 8132 (1999).**
35. O. Ciftja and S. Fantoni, *Fermi hypernetted-chain study of unprojected wave functions to describe the half-filled state of the fractional quantum Hall effect*, **Phys. Rev. B 58 (12), 7898 (1998).**
36. O. Ciftja and S. Fantoni, *Application of Fermi hypernetted-chain theory to composite fermion quantum Hall states*, **Phys. Rev. B 56 (20), 13290 (1997).**
37. O. Ciftja, S. Fantoni, J.W. Kim and M.L. Ristig, *Application of the Fermi hypernetted-chain theory and the effective correlation factor method for Laughlin quantum Hall states*, **J. Low. Temp. Phys. 108, 357 (1997).**
38. O. Ciftja, S. Fantoni and K. Gernoth, *Hypernetted-chain treatment and the extended shadow wave functions for the fractional quantum Hall hierarchical states*, **Phys. Rev. B 55 (20), 13739 (1997).**
39. O. Ciftja and S. Fantoni, *A new hypernetted-chain treatment for Laughlin quantum Hall states*, **Europhys. Lett. 36 (9), 663 (1996).**
40. R. Mejdani, A. Gashi, O. Ciftja and A. Lambros, *Ladder Ising spin configurations. Magnetic properties*, **Physica Status Solidi (b) 197, 153 (1996).**