

## CONTENTS

Foreword	v
Organizing Committees	ix
Preface	xi
<b>FEENBERG MEDAL AND KUEMMEL AWARD PRESENTATIONS</b>	<b>1</b>
The legacy of Eugene Feenberg at the centenary of his birth <i>J. W. Clark</i>	3
Stefano Fantoni: Feenberg Medalist 2007: Microscopic Many-Body Theory of Strongly Correlated Systems <i>A. Polls</i>	11
Eckhard Krotscheck: Feenberg Medalist 2007: Microscopic Many- Body Theory of Quantum Fluids <i>M. Saarela</i>	16
Frank Verstraete: Hermann Kuemmel Award 2007 <i>G. Ortiz</i>	20
Quantum Monte Carlo calculations for nuclei and nuclear matter <i>S. Fantoni, S. Gandolfi, F. Pederiva, and K. E. Schmidt</i>	23
Static and Dynamic Many-Body Correlations <i>E. Krotscheck and C. E. Campbell</i>	39
Entanglement in many-body quantum physics <i>F. Verstraete</i>	53

<b>COLD BOSE AND FERMI GASES</b>	<b>63</b>
New states of quantum matter	65
<i>G. Baym</i>	
Stationary Josephson effect in the BCS–BEC Crossover	75
<i>A. Spuntarelli, P. Pieri, and G. C. Strinati</i>	
Ultra-cold dipolar gases	79
<i>C. Menotti and M. Lewenstein</i>	
Crystalline phase of strongly interacting Fermi mixtures	94
<i>D. D. Petrov, G. E. Astrakharchik, D. Papoular, C. Salomon, and G. V. Shlyapnikov</i>	
Localization and glassiness of bosonic mixtures in optical lattices	106
<i>T. Roscilde, B. Horstmann, and J. I. Cirac</i>	
Scattering of a sound wave on a vortex in Bose–Einstein condensates	111
<i>P. Capuzzi, F. Federici, and M. P. Tosi</i>	
Static properties of a system of Bose hard rods in one dimension	116
<i>F. Mazzanti, G. E. Astrakharchik, J. Boronat, and J. Casulleras</i>	
A scenario for studying off-axis vortices in Bose–Einstein condensates	120
<i>D. M. Jezek, H. M. Cataldo, and P. Capuzzi</i>	
<b>NUCLEAR AND SUBNUCLEAR PHYSICS</b>	<b>125</b>
Strangeness nuclear physics	127
<i>A. Ramos</i>	
Many-body methods for nuclear systems at subnuclear densities	138
<i>A. Sedrakian and J. W. Clark</i>	
Correlations as a function of nucleon asymmetry: The lure of dripline physics	148
<i>W. H. Dickhoff</i>	
Fermi hypernetted chain description of doubly closed shell nuclei	152
<i>F. Arias de Saavedra, C. Bisconti, and G. Co’</i>	

Many-body challenges in nuclear-astrophysics <i>G. Martínez-Pinedo</i>	156
Coupled-cluster approach to an <i>ab-initio</i> description of nuclei <i>D. J. Dean, G. Hagen, M. Hjorth-Jensen, and T. Papenbrock</i>	168
Developing New Many-Body Approaches for No-Core Shell Model Calculations <i>B. R. Barrett, A. F. Lisetskiy, P. Navrátil, I. Stetcu, and J. P. Vary</i>	172
Applications of in-medium chiral dynamics to nuclear structure <i>P. Finelli</i>	176
Variational Calculations of the Equation of State of Nuclear Matter <i>M. Takano, H. Kanzawa, K. Oyamatsu, and K. Sumiyoshi</i>	181
Refinement of the variational method with approximate energy expressions by taking into account 4-body cluster terms <i>K. Tanaka and M. Takano</i>	185
<b>COMPUTATIONAL QUANTUM MANY-BODY</b>	191
Nodal properties of fermion wave functions <i>L. Mitas and M. Bajdich</i>	193
Simulating rotating BEC: Vortices formation and over-critical rotations <i>S. A. Chin</i>	203
Polarizability in quantum dots via correlated quantum Monte Carlo <i>L. Colletti, F. Pederiva, E. Lipparini, and C. J. Umrigar</i>	213
Progress in Coupled Electron-Ion Monte Carlo Simulations of High-Pressure Hydrogen <i>C. Pierleoni, K. T. Delaney, M. A. Morales, D. M. Ceperley, and M. Holzmann</i>	217
<b>PHASE TRANSITIONS</b>	233
Quantum phase transitions on percolating lattices <i>T. Vojta and J. A. Hoyos</i>	235

Ground-state properties of a homogeneous 2D system of Bosons with dipolar interactions	245
<i>G. E. Astrakharchik, J. Boronat, J. Casulleras, I. L. Kurbakov, and Yu. E. Lozovik</i>	
Liquid-solid transition in Bose systems at $T = 0$ K: Analytic results about the ground state wave function	251
<i>E. Vitali, D. E. Galli, and L. Reatto</i>	
The exact renormalization group and pairing in many-fermion systems	255
<i>N. R. Walet</i>	
The spin-1/2 and spin-1 quantum $J_1-J'_1-J_2$ Heisenberg models on the square lattice	265
<i>R. F. Bishop, P. H. Y. Li, R. Darradi, and J. Richter</i>	
Liquid-gas phase transition in nuclear matter within a correlated approach	275
<i>A. Rios, A. Polls, A. Ramos, and H. Müther</i>	
<b>QUANTUM LIQUIDS AND SOLIDS</b>	<b>279</b>
Small clusters of para-hydrogen	281
<i>R. Guardiola and J. Navarro</i>	
Adhesive forces on helium in nontrivial geometries	291
<i>E. S. Hernández, A. Hernando, R. Mayol, and M. Pi</i>	
Rotational Spectra in Helium-4 Clusters and Droplets: Size Dependence and Rotational Linewidth	295
<i>R. E. Zillich and K. B. Whaley</i>	
Microscopic studies of solid $^4\text{He}$ with path integral projector Monte Carlo	300
<i>M. Rossi, R. Rota, E. Vitali, D. E. Galli, and L. Reatto</i>	
Liquid $^4\text{He}$ inside (10,10) carbon nanotubes	312
<i>M. C. Gordillo, J. Boronat and J. Casulleras</i>	
Spatial microstructure of fcc quantum crystals	316
<i>M. J. Harrison and K. A. Gernoth</i>	

<b>STRONGLY CORRELATED ELECTRONS</b>	321
Nucleation of vortices in superconductors in confined geometries <i>W. M. Wu, M. B. Sobnack, and F. V. Kusmartsev</i>	323
The correlated density and the Bernoulli potential in superconductors <i>K. Morawetz, P. Lipavský, and J. Koláček</i>	332
Electron Correlations in Solids: From High-Temperature Superconductivity to Half-Metallic Ferromagnetism <i>E. Arrigoni, L. Chioncel, H. Allmaier, M. Aichhorn, and W. Hanke</i>	336
Excitons and polaritons in an optical lattice for cold-atoms within a cavity <i>H. Zoubi and H. Ritsch</i>	346
<b>ATOMS AND MOLECULES</b>	351
Fixed-Node Quantum Monte Carlo for Chemistry <i>M. Caffarel and A. Ramírez-Solís</i>	353
Quantum Monte Carlo for the electronic structure of atomic systems <i>A. Sarsa, E. Buendía, F. J. Gálvez, and P. Maldonado</i>	364
Hierarchical method for the dynamics of metal clusters in contact with an environment <i>G. Bousquet, P. M. Dinh, J. Messud, E. Suraud, M. Baer, F. Fehrer, and P.-G. Reinhard</i>	374
Population transfer processes: From atoms to clusters and Bose–Einstein condensate <i>V. O. Nesterenko, F. F. de Souza Cruz, E. L. Lapolli, and P.-G. Reinhard</i>	379
<b>QUANTUM COMPUTATION</b>	385
Generalized entanglement in static and dynamic quantum phase transitions <i>S. Deng, L. Viola, and G. Ortiz</i>	387
Entanglement percolation in quantum networks: How to establish large distance quantum correlations? <i>A. Acín, M. Lewenstein, and J. I. Cirac</i>	398

<b>NEW FRONTIERS</b>	409
Phonon-roton excitations and quantum phase transitions in liquid $^4\text{He}$ in nanoporous media	411
<i>H. R. Glyde, J. V. Pearce, J. Bossy, and H. Schober</i>	
Topological quantum order: A new paradigm in the physics of matter	423
<i>Z. Nussinov and G. Ortiz</i>	
Thermal rectification in one-dimensional chains	431
<i>N. Zeng and J.-S. Wang</i>	
Author Index	435
Subject Index	437