Curriculum Vitae

Maria Cristina Diamantini

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Personal Data:

Born October 6 1965 in Foligno (Italy). Swiss and Italian nationality. Married, two children. Italian mother tongue, fluent in English and French, knowledge of German (Goethe Institut Mittelstufe Diploma).

Education:

Diploma in Theoretical Physics summa cum laude, University of Perugia.

PhD in Theoretical Physics, University of Perugia.

Working Exeriences:

- 1/2/91 - 31/5/91: Researcher at the " Center for Nonlinear Study" at Los Alamos National Laboratory (Los Alamos, U.S.A.) with a fellowship of **Fondazione A. della Riccia**.
- 1/6/92 - 30/9/92: Researcher at the Physics Department of the University of British Columbia (Vancouver, Canada) with a fellowship of the University of British Columbia.
- 1/4/95 - 31/12/95: Researcher at the Physics Department of the University of Perugia (Italy) with a fellowship of the INFM (Istituto Nazionale Fisica della Materia).
- 31/12/95 - 31/5/97: Researcher at CERN (European Center for Nuclear Research),Theory Division, with a fellowship of the University of Perugia and a **Nato Grant**.

- 1/4/98 - 31/3/99: Researcher at the Freie Universitaet Berlin with a fellowship of the **von Humboldt Stiftung**.
- 1/4/99 - 31/3/2000: Researcher at the Physics Department of the University of Perugia (Italy) with a fellowship of the University of Perugia.
- 1/4/2000 - 31/8/2000: Researcher at the Department of Theoretical Physics, Oxford University (Oxford, England), with a fellowship of the **Swiss National Science Foundation**.
- 1/9/2000 - 31/1/2002: Researcher at CERN with a fellowship of the **Swiss National Science Foundation**.

h-index: 14 (google scholar).

Actual Position:
Researcher at the University of Perugia.
Responsible of the Statistical Mechanics course. Co-responsible of the organization of the Theoretical Physics courses at the University of Perugia.

Professional Activities:

- Local responsible for the INFN initiative FI11 " Statistical Field Theory, Low-Dimensional Systems, Integrable Models and Applications" supported by Gruppo IV I.N.F.N.,National Coordinator Andrea Cappelli INFN Firenze and in collaboration with: Domenico Giuliano INFN Cosenza; Nicodemo Magnoli INFN Genova; Enore Guadagnini INFN Pisa and Giuseppe Mussardo INFN Trieste.
- Member of the European projects: LANDAUER ("Operating ICT basic switches below the Landauer limit" , Grant Agreement n. 318287) and ZEROPOWER ("Co-ordinating Research Efforts Towards Zero-Power ICT", Grant Agreement n. 270005).
- Referee for APS (American Physical Society) journals, European Physics Letters and Physics Letters.

Membership:

- APS (American Physical Society),
- INFN (Istituto Nazionale Fisica Nucleare).

Research:
My field of interest involves two main lines of research.

The first research domain is in the interdisciplinary area between quantum field theory, condensed matter theory and statistical physics. This field developed considerably in the last twenty years, with the discovery of new and remarkable physical phenomena where quantum coherent effects are dominant and give rise to new and astonishing emergent behaviours. Such results led to introduce concepts and methods going beyond the ranges of established disciplines. The idea is to use powerful analytical methods from quantum field theory and statistical physics to analyze the new universality classes and phases of matter with topological features in two and three space dimensions, like the fractional quantum Hall systems, topological insulators and topological superconductors.

The second line of research concerns information theory. In trying to resolve the puzzle of Maxwells demon, Szilard was the first to realize that information processing, being a physical activity, has to obey the laws of thermodynamics. Landauer argued that the erasure of one bit of information has an entropic cost of at least $kT \ln 2$ (where T is the temperature and k the Boltzmann constant), that is since called the Landauer bound. While, at the time of Szilard, the transformation of information into work or vice-versa was a purely academic question, with the impressive developments in nano- and bio-technology and in statistical mechanics and thermodynamics (like the work and fluctuation theorem and thermodynamics for single trajectories), the issue has received renewed attention.

List of Publications

1. Anyon Representation of the Ground State Degeneracy of the Quantum Frustrated XY Model

   (coll. P. Sodano), Phys. Rev. B45, (1992) 5737.

2. SU(N) Antiferromagnets and the Phase Structure of QED in the Strong Coupling Limit

   (coll. E. Langmann, G.W. Semenoff and P. Sodano), Nucl. Phys. B406, (1993) 595.

3. Chiral Dynamics and Fermion Mass Generation in Three Dimensional Gauge Theory

   (coll. G.W. Semenoff and P. Sodano), Phys. Rev. Lett. 70, (1993) 3848.

4. Topological Excitations in Compact Maxwell-Chern-Simons Theory

   (coll. P. Sodano and C.A. Trugenberger), Phys. Rev. Lett. 71, (1993) 1969.

5. Oblique Confinement and Phase Transitions in Chern-Simons Gauge Theories

   (coll. P. Sodano and C.A. Trugenberger), Phys. Rev. Lett. 75, (1995) 3517.

6. Self-Duality and Oblique Confinement in Planar Gauge Theories

   (coll. P. Sodano and C.A. Trugenberger), Nucl. Phys. B 448, (1995) 505.

7. Gauge Theories of Josephson Junction Arrays

   (coll. P. Sodano and C.A. Trugenberger), Nucl. Phys. B 474 (1996) 641-677.

8. Topological Defects in Gauge Theories of Open p-branes

   Phys. Lett. B.388 (1996) 273.

9. 4D Confining Strings with Topological Term

   (coll. F. Quevedo and C.A. Trugenberger), hep-th/9612103, Phys. Lett. B396 (1997) 115-121.

10. Surfaces with Long Range Correlations from non-Critical Strings

    (coll. C.A. Trugenberger), hep-th/9712008, Phys. Lett. B421 (1998) 196.

11. Geometric Aspects of Confining Strings

    (coll. C.A. Trugenberger), hep-th/9803046, Nucl.Phys B531 (1998) 151.

12. String with Negative Stifness and Hyperfine Structure

    (coll. H. Kleinert and C.A. Trugenberger), Phys. Rev. Lett. 82 (1999) 267.

13. Floppy Membranes

    (coll. H. Kleinert and C.A. Trugenberger), cond-mat/9903021, Phys. Lett. A269 (2000) 1.

14. Universality Class of Confining Strings

    (coll. H. Kleinert and C.A. Trugenberger), hep-th/9903208, Phys. Lett. B457 (1999) 87.

15. Quantum Critical Phenomena for Spin Systems and Strongly Coupled Gauge Theories

    (coll. S. Jaimungal, G.W. Semenoff, P. Sodano), Comm. Math. Theor. Phys. 2 (1999) 44.

16. On Pure Lattice Chern-Simons Gauge Theories

    (coll. F. Berruto and P. Sodano), hep-th/0004203, Phys. Lett. B.487 (2000) 366.

17. Duality and Confinement in Massive Antisymmetric Tensor Gauge Theories

    hep-th/0104192, Phys. Lett. B512 (2001) 174.

18. Finite Size Scaling of Meson Propagators

    (coll. P.H. Damgaard, P. Hernandez and K. Jansen), hep-lat/0112016, Nucl. Phys. B629 (2002) 445.

19. QCD-Like Behaviour of High-Temperature Confining Strings

    (coll. C.A. Trugenberger), hep-th/0202178, Phys. Rev. Lett. 88 (2002) 251601.

20. Confining Strings at High Temperature

    (coll. C.A. Trugenberger), hep-th/0203053, JHEP 0204 (2002) 032.

21. Superconducting Topological Fluids in Josephson Junction Arrays

    (coll. P. Sodano and Carlo A. Trugenberger), J.Phys. A39 (2006) L253-L258.

22. Superconductors with Topological Order

    (coll. P. Sodano and Carlo A. Trugenberger), Eur.Phys.J. B53 (2006) 19.

23. Quantum Pattern Retrieval by Qubit Networks with Hebb Interactions

    (coll. C.A. Trugenberger), Phys. Rev. Lett. 97, 130503 (2006).

24. Superconductors with Topological Order and their Realization in Josephson Junction Arrays

    (coll. P. Sodano and Carlo A. Trugenberger), invited review, in "Superconductivity Research Advances", Nova Publishers.

25. Topological Order in Frustrated Josephson Junction Arrays

    (coll. P. Sodano and Carlo A. Trugenberger), Europhys.Lett.83:21003,2008.

26. Topological Quantum Phase Transitions in Topological Superconductors

    (coll. P. Sodano and Carlo A. Trugenberger), Europhys.Lett.92:57003, 2010.

27. Characterizing Topological Order in Superconducting Systems

    (coll. P. Sodano), Phys. Rev. B82 (2010) 144515.

28. SU(m) non-Abelian anyons in the Jain hierarchy of quantum Hall states

    (coll. C.A. Trugenberger), J. Phys. A: Math. Theor. 44 (2011) 115001.

29. The Fate of the Photon in Topological Matter: Superconductivity, Confinement and the Vortex Quantum Hall Effect

    (coll. C.A. Trugenberger), Phys. Rev. B 84 (2011) 094520; DOI: 10.1103/PhysRevB.84.094520.

30. From topological insulators to superconductors and Confinement

    (coll. P. Sodano and Carlo A. Trugenberger), New Journal of Physics 14 (2012) 063013.

31. Minimal Models for a Superconductor-Insulator Conformal Quantum Phase Transition

    (coll. C.A. Trugenberger), J. Phys. A: Math. Theor. 46 (2013) 115003.

32. Gauge Invariant Photon Mass Induced by Vortex Gauge Interactions

    (coll. G. Guarnaccia and C. A. Trugenberger), J. Phys. A: Math. Theor. 47 (2014) 092001.

33. Spin-Charge Soldering from Tensor Higgs mechanism

    (coll. Carlo A. Trugenberger), arXiv:1403.5677, Phys. Rev.D 89 (2014) 107702.

34. The Cost of Remembering: the Landauer Bound as the Capacity Limit of Associative Memories

    (coll. Carlo A. Trugenberger), arXiv:1403.5416, Phys. Rev.E 89 (2014) 052138.

35. Role of conditional entropy in experimental tests of Landauer Principle

    (coll. Davide Chiuchiu' and Luca Gammaitoni), arXiv:1406.2562, submitted to PRE.

36. Higgsless superconductivity from topological defects in compact BF terms

    (coll. Carlo A. Trugenberger), arXiv:1408.5066, submitted to Nucl. Phys. B.