

Proceedings of the European Science Foundation Exploratory Workshop on Interplay between Superconductivity and Magnetism at the Nanometer Scale (Paestum (Salerno), Italy, 19–22 June 2008)

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## PREFACE

# Proceedings of the European Science Foundation Exploratory Workshop on Interplay between Superconductivity and Magnetism at the Nanometer Scale (Paestum (Salerno), Italy, 19–22 June 2008)

### Guest Editor

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Each year, the European Science Foundation supports approximately 50 Exploratory Workshops across all scientific domains. These small, interactive group sessions are aimed at opening up new directions in research to explore new fields with a potential impact on developments in science.

We organized an Exploratory Workshop principally financed by the European Science Foundation on Interplay between Superconductivity and Magnetism at the Nanometer Scale (<http://supermat.physics.unisa.it/ew>) held in Paestum (Salerno), Italy, 19–22 June 2008.

The competition between magnetism and superconductivity has been the focus of considerable research efforts in recent years, focalizing growing interest. Superconductivity and ferromagnetism have always been considered two competing phenomena: a superconductor expels a magnetic field, which in turn tries to weaken the superconductivity. However, the coexistence of ferromagnetism and singlet superconductivity may be easily achieved in artificially fabricated hybrid superconductor–ferromagnet structures, by reducing at least one dimension of a subsystem in the nanoscopic range (otherwise, their mutual influence will be negligible). The interplay between magnetism and superconductivity can originate phenomena like spatial modulation of the order parameter,  $\pi$ -junctions, etc, that have a huge interest both on fundamental and applied physics and open the possibility for innovative applications in the field of spintronics.

The workshop had participation from across Europe and involved recognized leading experts as well as independent researchers with leadership potential. The small scale workshop has provided an ideal platform for focus on the topic and for all participants to contribute to the exchange of know-how and to promote international partnership among different communities through exciting discussions.

The participants discussed the scientific results obtained so far in order to find the best approach to analyze the problem. Bringing together observers, theoreticians, and modellers, the meeting allowed valuable interactions across the different disciplines in condensed matter physics. The participants discussed the European scale networking and collaboration that can produce crucial added value to these important fields in condensed matter physics research.

We expect the main outcome of this workshop to be the creation of new areas of collaboration among different European research groups in order to jointly address common interests related to the main topic of the workshop.