# LECTURES ON THE PHYSICS OF STRONGLY CORRELATED SYSTEMS XV

Fifteenth Training Course in the Physics of Strongly Correlated Systems

Vietri sul Mare (Salerno), Italy 4 – 15 October 2010

## **EDITORS**

Adolfo Avella Ferdinando Mancini Università degli Studi di Salerno Fisciano (SA), Italy

#### **SPONSORING ORGANIZATIONS**

Università degli Studi di Salerno, Italy International Institute for Advanced Scientific Studies "E. R. Caianiello", Italy European Science Foundation: INTELBIOMAT Programme European Physical Society



Melville, New York, 2011 AIP | CONFERENCE PROCEEDINGS 1419

#### **Editors**

Adolfo Avella Ferdinando Mancini

Dipartimento di Fisica "E.R. Caianiello" Università degli Studi di Salerno Via Ponte don Melillo I-84084 Fisciano (SA) Italy

E-mail: avella@sa.infn.it mancini@sa.infn.it

Authorization to photocopy items for internal or personal use, beyond the free copying permitted under the 1978 U.S. Copyright Law (see statement below), is granted by the American Institute of Physics for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$30.00 per copy is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923, USA: http://www.copyright.com. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Services is: 978-0-7354-0996-5/11/\$30.00

© 2011 American Institute of Physics

No claim is made to original U.S. Government works.

Permission is granted to quote from the AIP Conference Proceedings with the customary acknowledgment of the source. Republication of an article or portions thereof (e.g., extensive excerpts, figures, tables, etc.) in original form or in translation, as well as other types of reuse (e.g., in course packs) require formal permission from AIP and may be subject to fees. As a courtesy, the author of the original proceedings article should be informed of any request for republication/reuse. Permission may be obtained online using RightsLink. Locate the article online at http://proceedings.aip.org, then simply click on the RightsLink icon/"Permissions/ Reprints" link found in the article abstract. You may also address requests to: AIP Office of Rights and Permissions, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502, USA; Fax: 516-576-2450; Tel.: 516-576-2268; E-mail: rights@aip.org.

L.C. Catalog Card No. 2011943450 ISBN 978-0-7354-0996-5 (Original Print) ISSN 0094-243X Printed in the United States of America

# AIP Conference Proceedings, Volume 1419 Lectures on the Physics of Strongly Correlated Systems XV Fifteenth Training Course in the Physics of Strongly Correlated Systems

**Table of Contents** 

Preface: Lectures on the Physics of Strongly Correlated
Systems XV-Fifteenth Training Course in the Physics of
Strongly Correlated Systems
Adolfo Avella and Ferdinando Mancini

## PART I. LECTURES

1

The density matrix renormalization group and its time- dependent variants	
Adrian E. Feiguin	5
Strong correlations in solids: A survey of experimental facts Hans R. Ott	93
Static and dynamic variational principles for strongly correlated electron systems Michael Potthoff	19;
PART II. PARTICIPANT CONTRIBUTIONS	
Exact properties of the quantum compass model Wojciech Brzezicki	283
Coexistence of Kondo effect and ferromagnetism in the underscreened Kondo lattice model	
C. Thomas, A. S. R. Simões, J. R. Iglesias, C. Lacroix, N. B.	268

Perkins, and B. Coqblin

Interplay between strong correlations and electron-phonon	
coupling in cuprates: Comparison between different models	
Lev Vidmar and Janez Bonča	293

**Author Index** 

279