

# **International Summer School for Advanced Studies 2012 (PREDEAL12)**

## **Dynamics of Open Nuclear Systems**

**Journal of Physics: Conference Series Volume 413**

**Predeal, Romania  
9-20 July 2012**

**ISBN: 978-1-62276-991-9  
ISSN: 1742-6588**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2012) by the Institute of Physics  
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact the Institute of Physics  
at the address below.

Institute of Physics  
Dirac House, Temple Back  
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481  
Fax: 44 1 17 920 0979

[techtracking@iop.org](mailto:techtracking@iop.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## I. NUCLEAR STRUCTURE

<b>012001 Geometrical Symmetries in Atomic Nuclei: from Theory Predictions to Experimental Verifications</b> .....	1
<i>J Dudek, A Gózdź, H Moliq, D Curien</i>	
<b>012002 Nuclei: Superheavy–superneutronic–strange–and of Antimatter</b> .....	13
<i>W Greiner</i>	
<b>012003 Superheavy Elements Created at the Joint Institute for Nuclear Research</b> .....	28
<i>M Itkis</i>	
<b>012004 The Density Functional Method for Nuclear Systems. History and Perspectives</b> .....	36
<i>R J Lombard</i>	
<b>012005 Covariant Density Functional Theory for Exotic Nuclei Near the Neutron Drip-line</b> .....	48
<i>Y Chen, L L Li, Z P Li, H Z Liang, W H Long, P Ring, N V Giai, J M Yao, S Q Zhang, Y Zhang, P W Zhao, S G Zhou, J Meng</i>	
<b>012006 NUSTAR – Presence and Prospects of Nuclear Structure Research at Gsi and Fair</b> .....	58
<i>G Müntzenberg, H Geissel</i>	
<b>012007 Exotic Structure and Decay of Medium Mass Nuclei Near the Drip Lines</b> .....	68
<i>A Petrovici, K W Schmid, A Faessler</i>	
<b>012008 Pairing Correlations in Exotic Nuclei</b> .....	78
<i>H Sagawa, K Hagino</i>	
<b>012009 Alpha-Particle Condensation in Nuclear Systems</b> .....	90
<i>P Schuck, Y Funaki, H Horiuchi, G Röpke, A Tohsaki, T Yamada</i>	

## II. DECAY PROCESSES

<b>012010 Fine Structure of Alpha Decay of Even-even Trans-lead Nuclei – An Intriguing Nuclear Structure Paradigm</b> .....	105
<i>D Bucurescu, N V Zamfir</i>	
<b>012011 Clustering Features in Decay Processes</b> .....	113
<i>D S Delion</i>	
<b>012012 Developments in Radioactive Decay During the Last Century</b> .....	123
<i>R J Liotta</i>	
<b>012013 Two Center Shell Model Description of Superheavy Element Synthesis, Fission and Cluster Decay</b> .....	130
<i>M Mirea, A Sandulescu, D S Delion</i>	
<b>012014 <math>2\nu\beta\beta</math> Decay Within a Higher Pnqrpa Approach with the Gauge Symmetry Preserved</b> .....	141
<i>A A Raduta, C M Raduta</i>	
<b>012015 Systematics of Fine Structure in the <math>\alpha</math> Decay of Deformed Even-even Nuclei</b> .....	151
<i>D Ni, Z Ren</i>	
<b>012016 Double Beta Decay: An Interface Between Nuclear, Particle and Atomic Physics</b> .....	158
<i>J Suhonen</i>	
<b>012017 Cluster Decay Calculations Based on Mean-field Potentials</b> .....	168
<i>F R Xu, J C Pei, S M Wang</i>	

## III. NUCLEAR REACTIONS AND ASTROPHYSICS

<b>012018 Exploring the Nuclear Matter Phase Diagram with Heavy Ion Reactions</b> .....	173
<i>M Colonna, V Baran, M D Toro, C Rizzo</i>	
<b>012019 Some Aspects of the Phase Diagram of Nuclear Matter Relevant to Compact Stars</b> .....	183
<i>F Gulminelli, A R Raduta, J Margueron, P Papakonstantinou, M Oertel</i>	
<b>012020 Nuclear Structure for Reactions and Decays</b> .....	193
<i>M Horoi</i>	
<b>012021 Probing Nuclear Symmetry Energy and its Imprints on Properties of Nuclei, Nuclear Reactions, Neutron Stars and Gravitational Waves</b> .....	204
<i>B-A Li, L-W Chen, F J Fattoyev, W G Newton, C Xu</i>	

<b>012022 Centrality Dependence of Mid-rapidity Charged Particles Density in Relativistic Heavy Ion Collisions – Energy Scaling</b> .....	213
<i>M Petrovici, I Berceanu, A Pop, C Andrei, A Herghelegiu</i>	
<b>012023 Compact Stars and the Symmetry Energy</b> .....	220
<i>C Providência, R Cavagnoli, D P Menezes, P K Panda, A Rabhi</i>	
<b>012024 Selected Problems in Astrophysics of Compact Objects</b> .....	232
<i>A Sedrakian</i>	
<b>012025 Nuclear Astrophysics with Exotic Nuclei and Rare Ion Beams</b> .....	244
<i>L Trache</i>	
<b>012026 Nuclei in Dense Matter and Equation of State</b> .....	254
<i>S Typel</i>	

#### **IV. CONTRIBUTIONS**

<b>012027 Probing the Shell Structure of Heaviest Nuclei with <math>\alpha</math>-decay Data</b> .....	264
<i>A-I Budaca, I Silisteanu</i>	
<b>012028 A Semi-microscopic Approach to the Backbending Phenomena in Even-even Nuclei</b> .....	269
<i>A A Raduta, R Budaca</i>	
<b>012029 Towards a New Solvable Model for the Even-even Triaxial Nuclei</b> .....	274
<i>A A Raduta, P Buganu</i>	
<b>012030 Study of the Neutron Rich Sulfure Isotope <math>^{43}\text{S}</math> Through Intermediate Energy Coulomb Excitation</b> .....	279
<i>S Calinescu, L Cáceres, S Grévy, D Sohler, M Stanoiu, F Negoita, C Borcea, R Borcea, M Bowry, W Catford, Z Dombardi, S Franchoo, R Gillibert, J C Thomas, I Kuti, S Lukyanov, A Lepailleur, J Mrazek, M Niikura, Z Podolyak, C Petrone, Y Penionzhkevich, T Roger, F Rotaru, O Sorlin, I Stefan, Z Vajta, E Wilson</i>	
<b>012031 Model Dependence of Elliptic Flow Differences</b> .....	284
<i>M D Cozma</i>	
<b>012032 Systematic Study of the Isovector Pairing Effect on the Moment of Inertia of Proton-rich Nuclei in the Region <math>30 \leq Z \leq 40</math></b> .....	289
<i>I Ami, M Fellah, N Benhamouda, N H Allal</i>	
<b>012033 Runge-Kutta Methods of Special Form</b> .....	294
<i>L G Ixaru</i>	
<b>012034 Magnetic Rotation (MR) Band-crossing at High Spin States: Role of Nucleons in This Crossing in <math>N = 78</math> Odd-Z Isotones</b> .....	299
<i>S Kumar, R Garg, S K Mandal</i>	
<b>012035 Dissipation for Z-channels in Fission, Alpha-decay and Cluster Emission</b> .....	304
<i>N S Shakib, M F Rahimi, M M Firoozabadi</i>	
<b>012036 Low Energy Isomeric Levels of Nuclei Near <math>N=40</math></b> .....	309
<i>C Petrone, J M Daugas, M Stanoiu, F Negoita, G Simpson, C Borcea, R Borcea, L Cáceres, S Calinescu, R Chevrier, L Gaudefroy, G Georgiev, G Gey, C Plaisir, F Rotaru, O Sorlin, J C Thomas</i>	
<b>012037 The Structure of Tin Isotopes with a Global Optimized Effective Interaction</b> .....	313
<i>C Qi</i>	
<b>012038 Open Quantum Systems of Particles and Principle 2 of Thermodynamics</b> .....	318
<i>E Stefanescu</i>	
<b>Author Index</b>	