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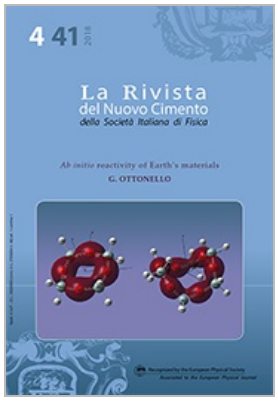
La Rivista del Nuovo Cimento Vol. 41 N. 4 (2018)



***Ab initio* reactivity of Earth's materials** *G. Ottonello*

Recent impressive improvements in the application of quantum mechanics, coupled with a significant increase in both speed and storage capabilities of modern computers, allow us to depict the energy and reactive properties of chemically complex materials through first principles, discarding the dogmatic assumption that natural complexity cannot be reproduced by a strict application of the theory. This is a conceptual revolution that deeply affects Earth Sciences in their hard-science-oriented branches, like Geochemistry and Geophysics. The novel approach is deeply beneficial to a quantitative assessment of the processes operating on the Earth at all scales of investigation, from molecular to planetary level.

Il Nuovo Cimento Vol. 40 N. 4 (2017)
R. Petronzio Memorial Symposium

Edited by *A. Di Ciaccio, N. Tantalo*

Roberto Petronzio, an outstanding theoretical physicist and former President of the INFN, passed away on the 28th of July 2016 at the age of 67 after a long and dramatic illness. One year after, a symposium in his honor was organized, held in the magnificent venue of Villa Mondragone in Monte Porzio Catone, a property of the University of Rome Tor Vergata. Roberto's fundamental contributions on many aspects of modern theoretical particle physics have been reviewed in fascinating talks given by prominent scientists who had the pleasure to share his friendship and to collaborate with him. The written versions of their talks are collected in this volume.

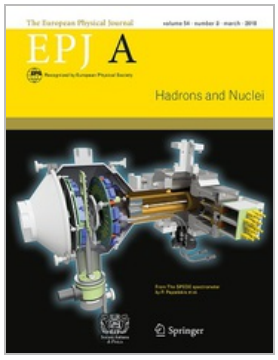
Il Nuovo Cimento Vol. 40 N. 5 (2017)
Les Rencontres de Physique de la Vallée d'Aoste – La Thuile 2017

Edited by *M. Greco*

The 2017 Rencontres de Physique de la Vallée d'Aoste were held at the Planibel Hotel of La Thuile, Aosta Valley, on March 5–11, with the XXXI edition of "Results and Perspectives in Particle Physics". The physics programme included various topics in particle physics, also in connection with present and future experimental facilities, as cosmology and astrophysics, neutrino physics, *CP* violation and rare decays, electroweak and hadron physics with e^+e^- and hadron colliders, Higgs physics, heavy flavours, searches for new physics and prospects at future facilities.

EPJ A – Highlights

Structure of exotic light nuclei: Z = 2, 3, 4



H.T. Fortune

Research into the origin of elements is still of great interest. Many unstable atomic nuclei live long enough to be able to serve as targets for further nuclear reactions - especially in hot environments like the interior of stars. And some of the research with exotic nuclei is, for instance, related to nuclear astrophysics. In this review published in EPJ A, Terry Fortune from the University of Pennsylvania, in Philadelphia, USA, discusses the structure of unstable and unbound forms of Helium, Lithium, and Beryllium nuclei that have unusually large neutron to proton ratios - dubbed 'exotic' light nuclei. The author offers an account of historical milestones in measurements and the interpretation of results pertaining to these nuclei.

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EPJ E – Highlights

Molecular dynamics simulations of inverse patchy colloids

S. Ferrari, G. Kahl, and E. Bianchi

What makes particles self-assemble into complex biological structures? Often, this phenomenon is due to the competition between forces of attraction and repulsion, produced by electric charges in various sections of the particles. In nature, these phenomena often occur in particles that are suspended in a medium - referred to as colloidal particles - such as proteins, DNA and RNA. To facilitate self-assembly, it is possible to "decorate" various sites on the surface of such particles with different charges, called patches. In a new study published in EPJ E, physicists have developed an algorithm to simulate the molecular dynamics of these patchy particles. The findings published by Silvano Ferrari and colleagues from the TU Vienna and the Centre for Computational Materials Science (CMS), Austria, will improve our understanding of what makes self-assembly in biological systems possible. In this study, the authors model charged patchy particles, which are made up of a rigid body with only two charged patches, located at opposite poles. They then develop the equations governing the dynamics of an ensemble of such colloidal patchy particles.

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