

# Editoria - febbraio 2017

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## **Il Nuovo Cimento, Vol. 39, N. 4 (2016)**

### **Les Rencontres de Physique de la Vallée d'Aoste – La Thuile 2016**

As customary, the 2016 Rencontres de Physique de la Vallée d'Aoste (celebrating the XXX edition of "Results and Perspectives in Particle Physics") were held in La Thuile, Aosta Valley, on March 6-12. 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. With the best of luck this thirtieth edition of the Rencontres was celebrated with the extraordinary event of the observation of the gravitational waves by the LIGO Collaboration.



## **La Rivista del Nuovo Cimento, Vol. 40, N. 1 (2017)**

### **The hydrodynamics of active systems**

*J. M. Yeomans*

An introduction is given to the hydrodynamics of active matter concentrating on low-Reynolds-number examples such as cells and molecular motors. The first part introduces the hydrodynamics of single active particles, covering the Stokes equation and the Scallop theorem, and stressing the link between autonomous activity and the dipolar symmetry of the far flow field. The second part discusses applications of this mathematics to the behaviour of microswimmers at surfaces and in external flows, and describes our current understanding of how swimmers stir the surrounding fluid. The third part concentrates on the collective behaviour of active particles, modelled as an active nematic. The equations of motion are given as well as the form of the active stress. The resulting hydrodynamic instability leads to a state termed "active turbulence" characterised by strong jets and vortices in the flow field and the continual creation and annihilation of pairs of topological defects. The last part compares simulations of active turbulence to experiments on suspensions of microtubules and molecular motors.

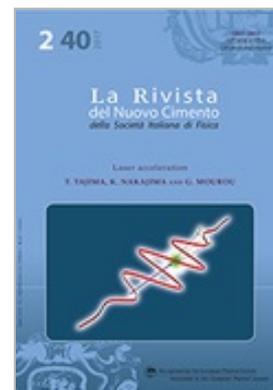


## **La Rivista del Nuovo Cimento, Vol. 40, N. 2 (2017)**

## Laser acceleration

*T. Tajima, K. Nakajima, G. Mourou*

The fundamental idea of Laser Wakefield Acceleration (LWFA) is reviewed. An ultrafast intense laser pulse drives coherent wakefield with a relativistic amplitude robustly supported by the plasma. While the large amplitude of wakefields involves collective resonant oscillations of the eigenmode of the entire plasma electrons, the wake phase velocity  $\sim c$  and ultrafastness of the laser pulse introduce the wake stability and rigidity. A large number of worldwide experiments show a rapid progress of this concept realization toward both the high-energy accelerator prospect and broad applications. Strong interest in this has emerged in the field of novel laser technologies, including the Chirped Pulse Amplification, the Thin Film Compression, the Coherent Amplification Network, and the Relativistic Mirror Compression. These in turn have created a conglomerate of novel science and technology with LWFA to form a new genre of high field science. Associated physics of ion acceleration, X-ray generation, and astrophysical processes of ultrahigh energy cosmic rays are reviewed. Applications such as X-ray free electron laser, cancer therapy, and radioisotope production etc. are considered. A new avenue of LWFA using nanomaterials is also emerging.



## EPJ E – Highlights

### Ratchet effect for two-dimensional nanoparticle motion in a corrugated oscillating channel

*M. Radtke, R. Netz*

In shampoo ads, hair always looks like a shiny, smooth surface. But for physicists peering into microscopes, the hair surface looks much more rugged, as it is made of saw-tooth, ratchet-like scales. In a new theoretical study published in EPJ E, Matthias Radtke and Roland Netz have demonstrated that massaging hair can help to apply drug treatment – encapsulated in nanoparticles trapped in the channels formed around individual hairs – to the hair roots. This is because the oscillatory movement of the massaging directs the way these particles are transported.

[Read more](#)



## EPJ Plus – Focus Point

### Focus Point on Plants for food, energy and sustainability

Guest Editors: *G. Alimonti, S. Johansson and L. Mariani*

During the twentieth century, modern agriculture was developed and now yields more food than ever: less than 20% of our global population works to provide the whole mankind with food. As environmental problems and resource constraints are arising, we now turn to agriculture in the hope for solutions regarding future sustainability. Could agriculture provide us with both food and fuel? Could we contribute to climate change mitigation by letting plants exploit the carbon dioxide that has been accumulated in the atmosphere? This Focus Point addresses the present and historical development of agriculture, perspectives of plant exploitation for food and energy production in a logic of social, economic and environmental sustainability.

[Read more](#)



## EPL – Highlights from the previous volumes

**Fluctuational electrodynamics for nonlinear media**

by *Soo Heino, Krüger Matthias*

**Granular rheology tuned via magnetic self-organization**

by *Cox Meredith et al.*

**Structure-function clustering in multiplex brain networks**

by *Crofts J.J. et al.*

**Forced mode coupling in 2D complex plasmas**

by *Couëdel L. et al.*

EPL Highlights are published in the first issue of each volume, *i.e.* four times a year, as well as in Europhysics News (EPN).

