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Tunable few-optical cycle pulses and advanced ultrafast spectroscopic techniques

S. De Silvestri, C. Manzoni, R. Borrego-Varillas, A. Oriana, G. Cerullo

Continuous progress in the generation of ultrashort pulse sources tunable from the near-infrared to the ultraviolet range provides very efficient spectroscopic tools to follow ultrafast dynamical processes in the matter. This review aims to introduce basic concepts for the generation of tunable ultrashort pulses and to show their application in ultrafast spectroscopic techniques. Pump-probe with broadband pulses and more recently two-dimensional spectroscopy allow to follow in great detail the role of light-harvesting complexes in photosynthesis, the primary photo-conversion effects in the vision process, dynamical processes in one-dimensional J-aggregates and quantum dots as well.



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Riprendiamo con questo numero la pubblicazione dei Quaderni di Storia della Fisica, con il proposito di mantenere una cadenza più regolare. Confidiamo in questo modo di soddisfare i lettori affezionati a questa pubblicazione distribuita gratuitamente agli abbonati del Giornale di Fisica. In questo numero troverete interessanti articoli quali:

- "Le capitali della luce. Il Nord Italia" di Miriam Focaccia
- "Augusto Righi: fisico e matematico. Una rilettura biografica" di Giorgio Dragoni
- "Da un atomo all'Universo. La vita e le opere di Georges Lemaître" di Dominique Lambert
- "L'evoluzione della spettroscopia nucleare in Italia dal 1950 agli anni 2000. La spettroscopia gamma" di Renato Angelo Ricci.



EPJ E – Highlights

Swarm relaxation: Equilibrating a large ensemble of computer simulations

S.M.A. Malek, R.K. Bowles, I. Saika-Voivod, F. Sciortino, Peter H. Poole

When the maths cannot be done by hand, physicists modelling complex systems, like the dynamics of biological molecules in the body, need to use computer simulations. Such complicated systems require a period of time before being measured, as they settle into a balanced state. The question is: how long do computer simulations need to run to be accurate? Speeding up processing time to elucidate highly complex study systems has been a common challenge. And it cannot be done by running parallel computations. That's because the results from the previous time lapse matters for computing the next time lapse. Now, Shahrazad Malek from the Memorial University of Newfoundland, Canada, and colleagues have developed a practical partial solution to the problem of saving time when using computer simulations that require bringing a complex system into a steady state of equilibrium and measuring its equilibrium properties. These findings are part of a special issue on "Advances in Computational Methods for Soft Matter Systems", recently published in EPJ E.

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EPJ E – Highlights

The role of DNA sequences in nucleosome breathing

J. Culkin, L. de Bruin, M. Tompitak, R. Phillips, H. Schiessel

Accessing DNA wrapped into basic units of packaging, called nucleosomes, depends on the underlying sequence of DNA building blocks, or base pairs. Like Christmas presents, some nucleosomes are easier to unwrap than others. This is because what makes the double helix stiffer or softer, straight or bent – in other words, what determines its elasticity – is the actual base pair sequence. In a new study published in EPJ E, Jamie Culkin from Leiden University, the Netherlands, and colleagues demonstrate the role of the DNA sequence in making it possible for packaged DNA to open up and let genes be read and expressed.

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