

BIOPHYS (1)

Monday, 13 February 2017 10:15 (5 minutes)

Computer simulations of polymer physics and the 3D structure of the human genome

Chromosomes in mammalian cells have a complex spatial organization serving vital functional purposes. We are showing that their 3D structure can be derived with high accuracy, and its molecular determinants identified, by use of polymer physics combined with advanced, massive computer simulations and high-throughput experimental data analysis. Chromosomes have a hierarchical architecture made of domains-within-domains, deeply linked to gene regulation. Predictions on the effects of genomic mutations are now confirmed by experiments. Our results are helping progressing the basic understanding of genome function and structure, as well as new diagnostic tools for diseases linked to chromatin misfolding, such as congenital disorders and cancer.

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Session Classification: Il calcolo ad alte prestazioni nella fisica teorica INFN