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The centers of premeltons signal the beginning and ends of genes

Premeltons are examples of emergent-structures (i.e., structural-solitons) that arise spontaneously in DNA due to the presence of nonlinear-excitations in its structure. They are of two kinds: B-B (or A-A) premeltons form at specific DNA-regions to nucleate site-specific DNA melting. These are stationary and, being globally-nontopological, undergo breather-motions that allow drugs and dyes to intercalate into DNA. B-A (or A-B) premeltons, on the other hand, are mobile, and being globally-topological, act as phase-boundaries transforming B- into A- DNA during the structural phase-transition. They are not expected to undergo breather motions. A key feature of both types of premeltons is the presence of an intermediate structural-form in their central regions (proposed as being a transition-state intermediate in DNA-melting and in the B- to A-transition), which differs from either A- or B- DNA. Called beta-DNA, this is both metastable and hyperflexible – and contains an alternating sugar-puckering pattern along the polymer backbone combined with the partial unstacking (in its lower energy-forms) of every-other base-pair. Beta-DNA is connected to either B- or to A- DNA on either side by boundaries possessing a gradation of nonlinear structural-change, these being called the kink and the antikink regions. The presence of premeltons in DNA leads to a unifying theory to understand much of DNA physical chemistry and molecular biology. In particular, premeltons are predicted to define the 5' and 3' ends of genes in naked-DNA and DNA in active-chromatin, this having important implications for understanding physical aspects of the initiation, elongation and termination of RNA-synthesis during transcription. For these and other reasons, the model will be of broader interest to the general-audience working in these areas. The model explains a wide variety of data, and carries with it a number of experimental predictions – all readily testable – as will be described in this talk.

Biography

Henry M Sobell has completed his studies at Brooklyn Technical High School (1948-1952), Columbia College (1952-1956) and the University of Virginia, School of Medicine (1956-1960) in Brooklyn New York. Instead of practicing Clinical Medicine, he then went to the Massachusetts Institute of Technology, Cambridge to join Professor Alexander Rich in the Department of Biology (1960-1965) as a Helen Hay Whitney Postdoctoral fellow; he learned the technique of single Crystal X- Ray Analysis. He then joined the Chemistry Department at the University of Rochester and was then jointly appointed to the Department of Biophysics School of Medicine and Dentistry becoming a full Professor in both departments (1965-1993). He is now retired and living in New York, USA.

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