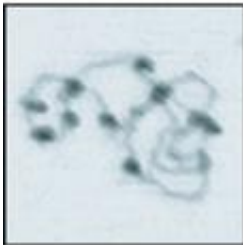


Biologists' discovery may force revision of biology textbooks

August 18 2011

Is It or Isn't It a Nucleosome?

Prenucleosomes



Nucleosomes



Atomic Force Microscopy Images

Credit: James Kadonaga, UC San Diego

Basic biology textbooks may need a bit of revising now that biologists at UC San Diego have discovered a never-before-noticed component of our basic genetic material.

According to the textbooks, chromatin, the natural state of DNA in the cell, is made up of [nucleosomes](#). And nucleosomes are the basic repeating unit of chromatin.

When viewed by a high powered microscope, nucleosomes look like beads on a string (photo at right). But in the August 19th issue of the journal *Molecular Cell*, UC San Diego biologists report their discovery of a novel chromatin particle halfway between DNA and a nucleosome

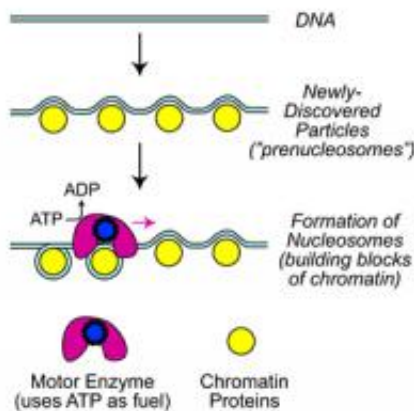
(photo at left). While it looks like a nucleosome, they say, it is in fact a distinct particle of its own.

"This novel particle was found as a precursor to a nucleosome," said James Kadonaga, a professor of biology at UC San Diego who headed the research team and calls the particle a "pre-nucleosome." "These findings suggest that it is necessary to reconsider what chromatin is. The pre-nucleosome is likely to be an important player in how our [genetic material](#) is duplicated and used."

The [biologists](#) say that while the pre-nucleosome may look something like a nucleosome under the microscope, biochemical tests have shown that it is in reality halfway between DNA and a nucleosome.

These pre-nucleosomes, the researchers say, are converted into nucleosomes by a motor protein that uses the energy molecule ATP (see graphic).

Mechanism of Chromatin Assembly



Credit: James Kadonaga, UC San Diego

"The discovery of pre-nucleosomes suggests that much of chromatin, which has been generally presumed to consist only of nucleosomes, may be a mixture of nucleosomes and pre-nucleosomes," said Kadonaga. "So, this discovery may be the beginning of a revolution in our understanding of what chromatin is."

"The packaging of DNA with [histone proteins](#) to form chromatin helps stabilize [chromosomes](#) and plays an important role in regulating gene activities and [DNA replication](#)," said Anthony Carter, who oversees chromatin grants at the National Institute of General Medical Sciences of the National Institutes of Health, which funded the research. "The discovery of a novel intermediate DNA-histone complex offers intriguing insights into the nature of chromatin and may help us better understand how it impacts these key cellular processes."

Provided by University of California - San Diego

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