The Ohio State University Biophysics Program

13th Annual Robert Ross Lectureship

Karolin Luger
University of Colorado, Boulder

Thursday, March 21

1:00-2:30 in 170 Davis Heart & Lung Research Institute
473 W 12th

2:30-3:30 Students meet speaker (snacks provided)
159 DHLRI

Adventures in the chromatin jungle:

Nucleosome evolution and interactions

Invariably, all eukaryotes organize their DNA into nucleosomes, consisting of an octamer of the four core histone proteins H2A, H2B, H3, and H4, around which 147 base pairs of DNA are wrapped in two tight superhelical turns. With the discovery of small histone-like proteins in most known Archaea, the likely origin of this fold was identified. Most Archaea encode only one or two minimal histones that form polymers around which DNA coils in a quasi-continuous superhelix rather than forming defined particles. I will discuss implications of this discovery for the evolutionary origins of eukaryotic chromatin.

Nucleosomes are highly abundant, and all nuclear factors have to operate in this structural context. Poly(ADP-ribose) polymerase 1 (PARP1) and the less abundant PARP2 together are essential for the DNA damage repair response in all eukaryotic cells. PARP1 and PARP2 bind tightly to chromatin and nucleosomes, yet are rapidly recruited to sites of DNA damage. Using live-cell imaging coupled with mathematical modeling, we studied the rapid recruitment of PARP1 to sites of DNA damage in vivo. Combined with millisecond timescale measurements of DNA binding to PARP1 in vitro, we arrived at a mechanism for PARP1 movement in the nucleus.