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**A Physics Approach to the Repositioning of DNA Damage** SARAH LEGRESLEY, MATTHEW ANTONIK, University of Kansas — An open question in genome maintenance is how DNA repair proteins find lesions at rates that seem to exceed diffusion limited search rates. We propose a phenomenon where DNA damage induces nucleosomal rearrangements which move lesions to potential rendezvous points which are more likely to be accessible by repair proteins engaged in a random search. The feasibility of this mechanism is tested by considering the statistical mechanics of DNA containing a single lesion wrapped onto the nucleosome. We consider lesions which make the DNA either more rigid or more flexible. This can be modeled as an increase or decrease in the bending energy in a partition function of nucleosome breathing. Our results indicate that the steady state for a breathing nucleosome will most likely position the lesion at the dyad or in the linker DNA, depending on the energy of the lesion. We speculate that these positions potentially serve as rendezvous points where DNA lesions may be encountered by repair proteins which may be sterically hindered from searching the rest of the nucleosomal DNA. A more sophisticated evaluation of this proposed mechanism will require detailed information about breathing dynamics, the structure of partially wrapped nucleosomes, and the structural properties of damaged DNA.

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