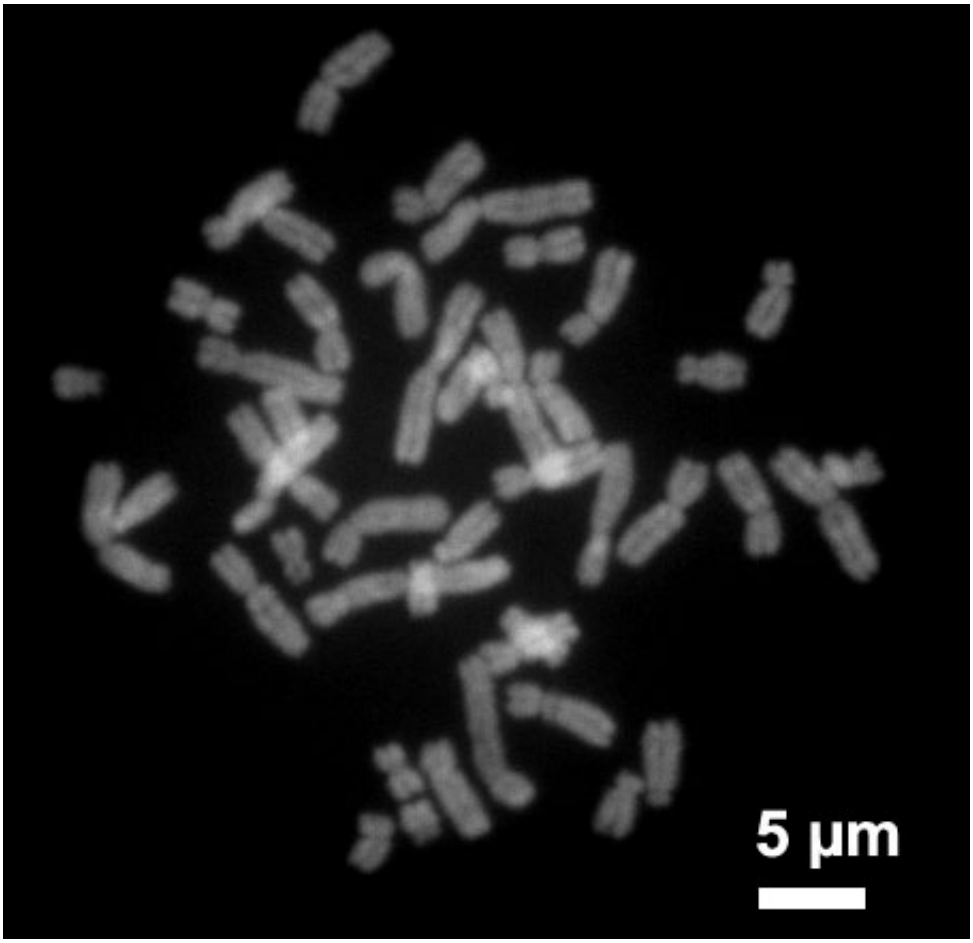
Researchers find chromosome cooperation is long-distance endeavor

June 1 2017



Human chromosomes during metaphase. Credit: Steffen Dietzel/Wikipedia

Multiple genomic elements work cooperatively and over long distances in order to ensure the proper functioning of chromosomes, a team of

scientists has found. Its research offers new insights into the complexity of gene regulation.

The discovery, reported in the journal *eLife*, centers on condensins—proteins that are crucial in chromosome assembly and in cell division.

"Condensin complexes are essential for development, but the molecular mechanisms behind their function remain unclear," explains Sevinc Ercan, an associate professor in New York University's Department of Biology and the paper's senior author. "We now have a better understanding of their binding mechanisms, which is vital as condensin mutations inhibit genome activity, potentially leading to cancer and other diseases."

The researchers examined this process in the worm C. elegans. It is the first animal species whose genome was completely sequenced and therefore a model organism for studying genetics.

It's been long understood that the structure of chromosomes change dramatically during development. In addition, it has been established that functional genomic elements containing specific DNA sequences "recruit" condensins. However, the molecular orchestration by which this process occurs is not evident.

In the *eLife* study, the researchers found that, in fact, multiple genomic elements work cooperatively, which helps ensure that the correct condensins are recruited for the task of structuring chromosomes in a specific manner. Moreover, this interaction occurs over relatively long distances across the length of the chromosomes, underscoring the intricate and holistic nature of this process.

"By understanding the mechanisms by which genomes properly function,

we have a firmer grasp of comprehending the nature and significance of abnormalities, giving us a clearer picture of how to begin to address them," observes Ercan.

Provided by New York University