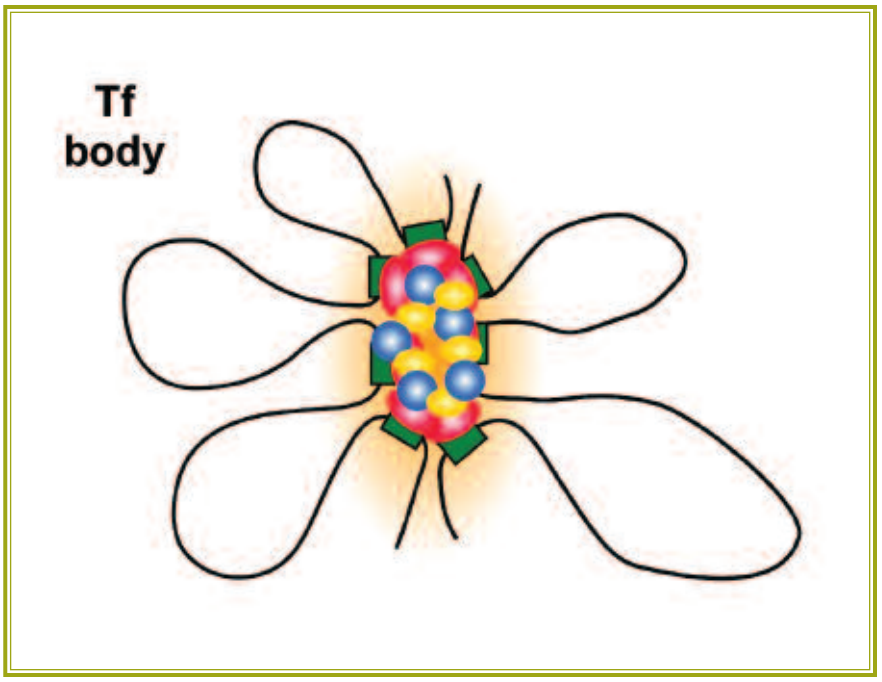

By silencing and clustering Tf2 retrotransposons (green), proteins of the CENP-B family (red), themselves the remnants of ancient transposons, regulate the movement and placement of these mobile genetic elements and help maintain the organization and integrity of the genome.

(*Image: S. Grewal, CCR*)

Transposon, Regulate Thyself

The neighborhood around the genome is not a quiet place. Rather, it has all of the activity of a city at rush hour: Chromosomes ravel and unravel, DNA unzips while proteins zoom in for transcription or replication, and RNAs zoom out for translation into proteins.

Adding to the frenzy are genes that just cannot sit still. Called transposable elements or transposons, these "jumping genes" move about the genome with abandon. Generally considered to be the remains of ancient viruses that merged into our DNA far back in our evolutionary past, transposons exist in two distinct classes: DNA transposons and RNA-based retrotransposons.

With their ability to randomly cut- or copy-and-paste themselves into just about any genomic location, transposons can be both boon and bane. They can increase genome size and complexity, providing fertile ground for the development and evolution of new traits. Or they can wreak genomic havoc by disrupting genes critical for normal cellular functions, such as proliferation and apoptosis.

Because they can have such widespread and powerful effects, the genome needs to keep the activity of transposons under tight control. In the January 24, 2008, issue of the journal *Nature*, Laboratory of Biochemistry and Molecular Biology Senior Investigator Shiv Grewal, Ph.D., Postdoctoral Fellow Hugh Cam, Ph.D., and their colleagues reported the results of studies in yeast revealing the existence of a powerful mechanism by which the genome may regulate how and where transposons move and act.

This surveillance system centers on the action of a group of proteins homologous to a human protein family called the CENP-B family. According to the Grewal team's results, the CENP-B proteins—themselves derived from the remnants of past transposons—seek out and silence a group of retrotransposons called the Tf2 family. The CENP-Bs also appear to be able to corral these retrotransposons into clusters, called Tf bodies, which may facilitate the proteins' surveillance tasks and also have wider implications for genome organization, gene regulation, and response to environmental stresses.

Taken together, the scientists' results suggest that the genome has, over time, tamed some of these "jumping genes" and redirected them into roles where they regulate their own kin, thereby helping to maintain genome integrity.