Abstract: Telomeres are the caps at chromosome ends that are essential for preserving the genome. When chromosomes lose their telomere caps the cells die or can no longer divide, and this contributes to the onset of degenerative diseases with aging. If chromosomes lose their telomere caps in pre-cancerous cells then this causes genetic alterations that hasten the progression to cancer. Telomeres shorten every time a cell divides, and as a result they shorten in humans as we age. The enzyme telomerase lengthens telomeres but is deficient in most human cells. Telomeres and telomerase were first discovered in a simple ciliate organism as the result of “curiosity-driven” research to understand how chromosome ends are protected and maintained. This discovery led to a new scientific field, a Nobel prize in 2009, and novel insights into molecular mechanisms underlying various degenerative human diseases and cancer. Our lab is studying how damage to telomeric DNA accelerates telomeres loss, and the cellular pathways that preserve telomeres. We propose that a better understanding of how telomere caps are damaged and repaired will lead to novel intervention strategies to preserve telomeres and promote healthy aging.