



## Taekjip Ha

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Dr. Taekjip Ha is a Bloomberg Distinguished Professor of Biophysics and Biomedical Engineering at Johns Hopkins University and an investigator with the Howard Hughes Medical Institute. He develops and uses single molecule and single cell measurement tools to study life at high resolution.

Dr. Ha received a bachelor in Physics from Seoul National University in 1990 and Physics Ph.D from University of California at Berkeley in 1996. After postdoctoral training at Stanford, he was a Physics professor at University of Illinois at Urbana-Champaign until 2015.

Dr. Ha serves on Editorial Boards for Science, Cell and eLife. He is a member of the National Academy of Science and a fellow of the American Academy of Arts and Sciences. He received the 2011 HoAm Prize in Science.

### **Abstract: CRISPR and DNA Repair**

Double strand breaks (DSB) are frequently generated, and researchers have discovered many proteins and processes needed to repair the breaks. However, relative timing of sub-stages of DNA repair or even their ordering has been difficult to determine due to the lack of method to synchronize the generation of well-defined breaks in living cells. Exposing cells to X-ray and UV can produce massive DNA damages at a defined time point, but the nature of the damage is ill-defined, and damages are made randomly. CRISPR-Cas systems allow the generation of breaks at specifically defined genome locations, but despite many attempts to develop ligand- or light-inducible CRISPR-Cas systems, the cleavage kinetics remains slow, leading to unsynchronized repair. We developed a very fast CRISPR-Cas9 can generate a DNA break at a defined locus at a well-define (within seconds) time point, allowing us to reveal the mechanisms of break recognition and study DSB repair and other cellular processes with an unprecedented spatiotemporal control.