הפקולטה לכימיה ע"ש שוליך
טכניון – מכון טכנולוגי לישראל

Faculty of Chemistry
SCHULICH
Technion, Israel Institute of Technology

המעבדה לכימיה אורגנית ואי-אורגנית

סמינר

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Dr. Nir Hananya

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בנושא:

Chemical biology avenues to illuminate chromatin modifications and protein-protein interactions

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Chemical biology avenues to illuminate chromatin modifications and protein-protein interactions

The lecture will describe my postdoctoral work at the Department of Chemistry at Princeton University, focusing on two research projects. First, I will introduce a chemical biology approach to studying the roles of chromatin ADP-ribosylation. Chromatin, the complex of DNA and proteins which constitutes our genome, integrates environmental and developmental signals to regulate essential cellular processes, such as replication, transcription, and DNA repair. A key mechanism in this regulation is the post-translational modification of histones, the basic proteins responsible for packaging the DNA into nucleosomes. My research focuses on a unique histone modification, serine ADP-ribosylation, rapidly deposited on histones after a DNA break is detected. Very little is known about histone ADP-ribosylation's roles in DNA repair because of a lack of molecular tools to study this vital chemical modification. I will describe an efficient and modular semisynthetic route to chromatin substrates modified site-specifically with ADP-ribose. The availability of these extraordinary reagents enables biochemical and biophysical investigations of the impact of ADP-ribosylation on chromatin. In addition, by employing a synthetic biology approach, ADP-ribosylated histones with photo-affinity traps were installed in native chromatin. This method allows for the covalent binding and characterization of specific ADP-ribose interacting proteins. In the second part of my talk, I will introduce a novel photochemistry-based method to achieve proximity labeling of proteins, which is useful for mapping protein-protein interactions in living cells. This technology, termed 'LITag' (**L**ight-induced **I**nteractome **Tag**ging), involves fusing an engineered flavoprotein to a protein of interest. Brief visible light irradiation of the fusion protein leads to the local generation of reactive radical species that tag neighboring biomolecules covalently, thereby providing a 'snapshot' of protein interactome with an unprecedented temporal resolution. I illustrate how LITag can be applied to characterize the protein network associated with the DNA damage response. Overall, these projects demonstrate the great value of chemistry-driven tools in illuminating essential aspects of cell biology.