

Department of Chemistry and Molecular Biology  
Biochemistry Candidate Seminar  
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## Dissecting the regulatory mechanisms of eukaryotic transcriptional activation *in vivo*

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### **Abstract**

A growing number of human diseases including various types of cancers are linked to abnormal gene regulation, and thus a detailed understanding of the proteins and regulatory mechanisms that dictate altered gene expression is a vital step towards developing drugs and therapies for maintaining normal cellular functions. However, how the blueprint of eukaryotic genomic information is transcribed into the complex patterns of regulated gene expression, which is mostly controlled at the level of transcriptional activation by gene-specific activators in living cells, remains largely unknown. Transcriptional activation by activators involves the stimulation of the assembly of general transcription factors as well as the RNA polymerase II on the promoter to form a preinitiation complex (PIC). Such a stimulated assembly of the PIC is believed to result from a direct interaction between the activator and one or more components of the transcription machinery, termed the "target". Based primarily upon *in vitro* protein-protein interaction experiments, a variety of factors have been proposed to be the direct targets of activators. However, whether any of these are bona fide *in vivo* targets required for stimulation of the PIC assembly and hence transcriptional activation remains mostly unknown, primarily because of lack of appropriate experimental methods. Recently, using two powerful techniques such as chromatin-immunoprecipitation (ChIP) and fluorescence resonance energy transfer (FRET), we have identified SAGA (Spt-Ada-Gcn5-Acetyltransferase) as an *in vivo* target of a well characterized activator Gal4, and then we have demonstrated how Gal4-SAGA interaction stimulates PIC assembly *in vivo*. Further, we have continued our study to identify other activator-targets and study how these activator-target interactions promote PIC assembly in living eukaryotic cells in order to understand the detailed mechanism-of-action by which promoter-specific activators function through a common general machinery to stimulate transcription. These results will be presented in the seminar.