

# National Academies Keck *Futures Initiative* Conference

Mathematical Models in Signaling Systems - June 16-18, 2004

## ***Experimental Approaches to Understanding Networks***

### *Buffering Fluctuations in Morphogen Production Rate by Decoding the Pre-steady State Morphogen Profile*

Naama Barkai, PhD  
Principal Investigator  
Weizmann Institute of Science

#### ***Abstract:***

Signaling gradients are established by the localized production and subsequent diffusion of morphogen molecules. It is generally assumed that cell-fates are induced only after morphogen profiles have reached their steady state. Yet, processes during early development occur rapidly, and tissue patterning may precede the convergence of the gradient to its steady state. Here we show that decoding the pre-steady state morphogen profile can reduce patterning errors caused by fluctuations in the rate of morphogen production. Quantitative analysis of Bicoid distribution and gap gene expression domains suggests that a transient decoding mechanism is indeed employed during the initial patterning of the anterior-posterior axis in *Drosophila* embryos. This can explain the surprisingly small shift in gap and pair-rule gene expression domains observed in response to alterations in Bicoid morphogen levels.