— Invited Talk —

Protein Interactions

David Eisenberg\textsuperscript{1} Ioannis Xenarios\textsuperscript{1} Joyce Duan\textsuperscript{1}
Lukasz Salwinski\textsuperscript{1} Todd Yeates\textsuperscript{1}
Matteo Pellegrini\textsuperscript{2} Michael J. Thompson\textsuperscript{2} Edward Marcotte\textsuperscript{2}

\textsuperscript{1} UCLA-DOE Laboratory of Structural Biology and Molecular Medicine, Box 951570, UCLA, Los Angeles CA 90095-1570, USA
\textsuperscript{2} Protein Pathways, 1145 Gayley Avenue, Los Angeles CA 90024, USA

Keywords: protein interactions, Rosetta Stone, phylogenetic profiles

Networks of protein interactions control the lives of cells, yet we are only beginning to appreciate the nature and complexity of these networks.

We have taken two approaches to the study of protein networks. The first is to infer functional interactions between pairs of proteins, by combining four methods: Rosetta Stone (fused domains), Phylogenetic Profiles (correlated occurrence of pairs of proteins in genomes), Gene Neighbor (separation of pairs of protein-encoding genes on chromosomes), and analysis of DNA microarray signals. This combination produces networks of protein functional interactions.

The second approach is to reconstruct networks from published studies in the scientific literature. This Database of Interacting Proteins (http://dip.doe-mbi.ucla.edu), DIP for short, has now grown to thousands of interactions, and provides a second type of network of cellular protein interactions. The network from DIP is of physically interacting proteins, whereas the network of functional interactions is broader, including information on metabolic and signaling interactions.

A new level of information added to the DIP is that pertaining to Protein States, given in LiveDIP. Gene-encoded proteins can exist in various states of covalent modification, oligomerization, alternative splicings, and cellular localizations. Protein interactions often depend on these states. To describe the interactions realistically, it is important to include the states, and the transitions between these states.