BIOINFORMATICS SEMINAR

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Inferring Genomic Regulatory Systems: The Davidson Model

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ABSTRACT:

Understanding the functional meaning of the genomic DNA sequence might well be considered the most important problem in bioscience. In the post-assembly phase of genomics, aiming towards the functional-maps of the cell, a most exciting phase has been the construction of the cis-regulatory maps. The literature of the area in the last few years witnessed an explosion of new technologies and experimental data. This accelerated progress in understanding the genomic control apparatus of gene expression led to the inference of developmental regulatory networks of extraordinary complexity. By all accounts, it appears that the unveiling of the cis-regulatory code is near.

In 2001 Eric Davidson published the book Genomic Regulatory Systems, where he reports on 30 years of work at Caltech, assisted by 300 docs and postdocs, on sea urchin. The Davidson Lab work provided a general experimental framework for the study of a gene's cis-regulatory region and for regulatory network inference. The work proceeded hierarchically to uncover the "hardwired information processing logic" of gene regulation. Their technology, intertwined with analytical inference, resulted in the most completely understood transcriptional systems to date. For the area, their major accomplishments might as well be called: the "First Gene:" endo16, and the "First Network:" A Provisional Regulatory Gene Network for Specification of Endomesoderm in the Sea Urchin Embryo.

We will give an introduction and a mathematical analysis of the basic modeling theory developed by the Davidson Lab, organized as a "Davidson for Computer Scientists" presentation. We will also present a glance into our recent work with Eric Davidson towards the identification of the regulatory circuitry building blocks involved in regulatory information processing. As a context for the presentation, I will talk about two Applied Biosystems projects. The first focuses on providing industrial strength acceleration of the discovery of the cis-regulatory code. The second is devoted to integrative road-maps, part of our effort to build a programming language for genomics ("G").

Monday March 31, 2003
11:00 a.m. – 1:00 p.m.
(Talk starts at 11:30)
Building NE43, Room 941

Refreshments at 11am in NE43-941
(LCS, 200 Tech Square, Cambridge, MA)

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