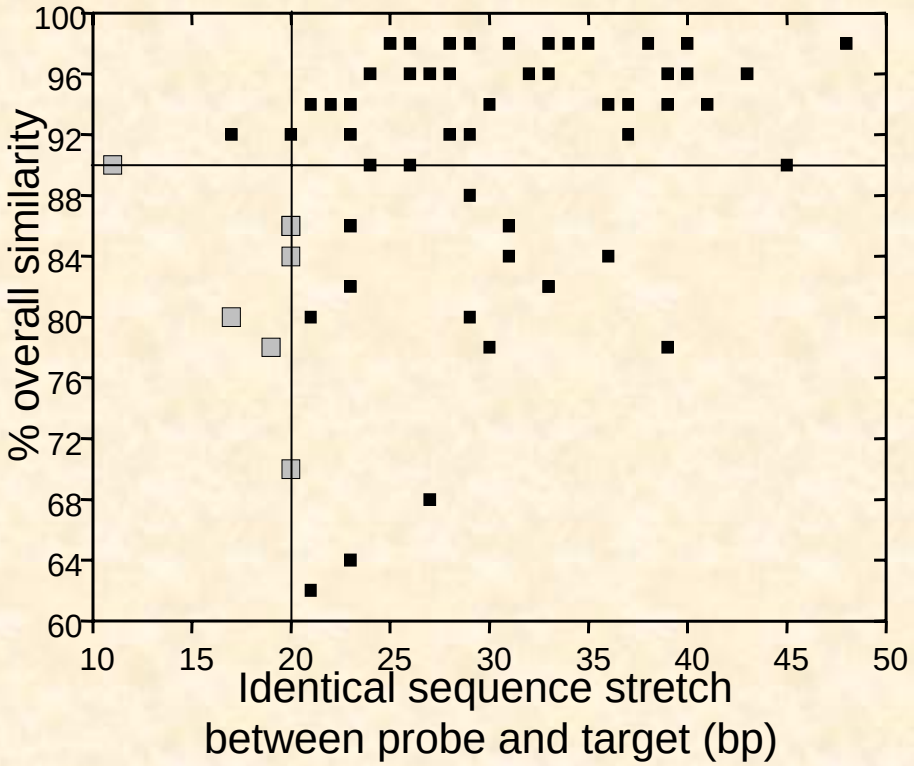
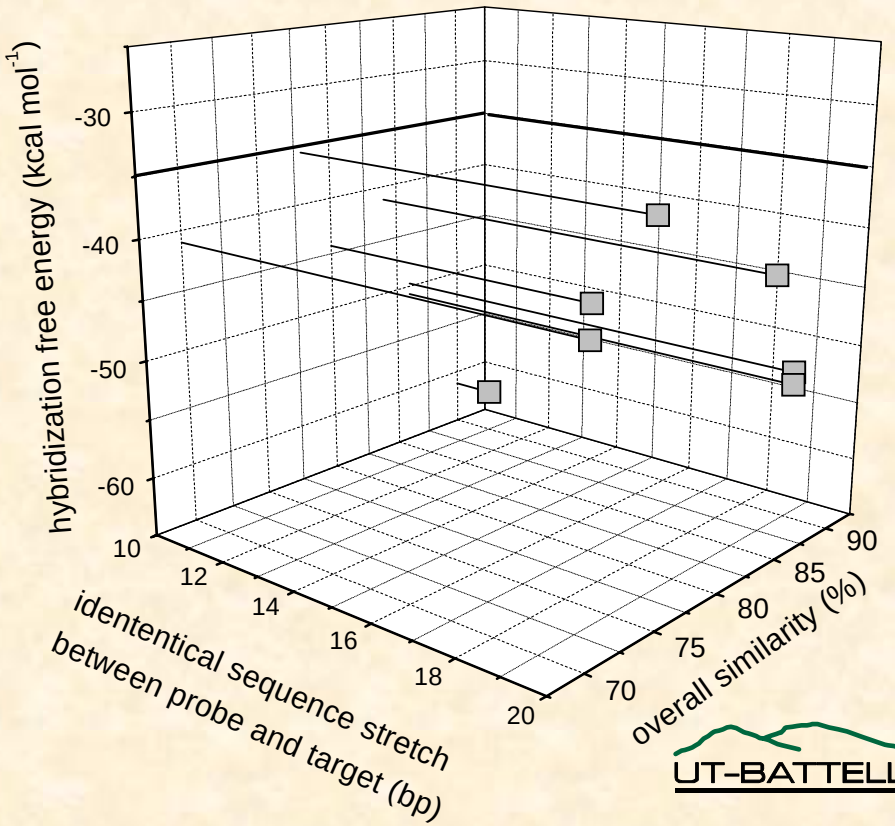
Multiple Design Criteria Improve Environmental Microarray Probe Selection and Specificity

Contact: Chris Schadt, schadtcw@ornl.gov, 865-576-3982
DOE/Office of Science/Biological & Environmental Research



Simultaneous consideration of overall, probe similarity, longest identical stretch, and free energy, improves predictability of hybridization behaviors



OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY
UT-BATTELLE

Multiple Design Criteria Improve Environmental Microarray Probe Selection and Specificity

Contact: Chris Schadt, schadtcw@ornl.gov, 865-576-3982
DOE/Office of Science/Biological & Environmental Research

Microarrays are useful for environmental studies by helping to identify the types of microbial activities involved in various biogeochemical processes. This in turn allows for improved predictability and control of these microbial processes. The gene probes on such microarrays have to be able to distinguish between thousands of closely related genes. Most probe design algorithms use only one criteria to ensure specificity such as % similarity and set restrictive criteria.

Our studies show that probe behavior and specificity may be more reliably predicted by examining multiple probe characteristics. By simultaneously considering % similarity, longest identical stretch, and free energy of the hybridization (ΔG), we can actually relax the individual criteria while at the same time more accurately ensuring the specificity of the probes (Liebich et al.).

To implement these criteria new probe design algorithms and a program (Li et al.) have been developed and applied to a design a functional gene array containing over 24,000 probes for genes involved in important microbially-driven processes relevant to bioremediation as well as carbon cycling and sequestration.

Li, X., Z. He and J.-Z. Zhou. 2005. Selection of optimal oligonucleotide probes for microarrays using multiple criteria, global alignment and parameter estimation. *Nucleic Acids Research* 33: 6114–6123.

Liebich, J., C.W. Schadt, S.C. Chong, Z. He, S.K. Rhee, and J.-Z. Zhou. 2006. Improvement of Oligonucleotide Probe Design Criteria for Functional Gene Microarrays in Environmental Applications. *Appl. Environ. Microbiol.* 72:1688-1691.