1079-92-1 **Anne Condon*** (condon@cs.ubc.ca), 2366 Main Mall, University of British Columbia, Computer Science Department, Vancouver, BC V6R 2C5, Canada. *Some why's and how's of programming DNA molecules.*

Programs that execute within cells or that create intricate structures at nano-scale resolution are now a reality—designed and implemented using DNA molecules. In this talk I'll illustrate some why's and how's of DNA programming, and I'll describe research problems with a combinatorial and algorithmic flavour that arise in this field.

Why might we program molecules? Molecular programming offers the promise of understanding and changing our world at staggeringly small scales, with applications to disease diagnosis and therapeutics.

How can we program DNA molecules? We can leverage molecular sequence, structure and folding pathways. Programs are *sequences* of A,C,G and T bases that comprise DNA molecules. DNA *structure* arises when complementary bases bind to form A-T and C-G pairs; thus sequences can be programmed to create intricate nano-scale shapes. Finally, *folding pathways* - successions of structural changes over time - support molecular movement, thereby providing ways to realize tiny DNA robots.

Research challenges of a theoretical nature that are motivated by DNA computations include: understanding the capabilities of new models of computation, predicting the behavior of interating molecules, and designing efficient means detecting and correcting errors. (Received June 21, 2011)