Title: Some How's and Why's of Programming DNA Molecules

Abstract:

Programs that execute within cells or that create intricate structures at nano-scale resolution are now a reality---designed and implemented using DNA molecules. As the scale and variety of DNA programs expands, a rich theory of molecular programming is emerging.

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. It also prompts us to broaden our views of computation and its role in producing order and complexity in living systems.

How can we program molecules? At a low level of abstraction, DNA programs are sequences of A,C,G and T bases that comprise DNA molecules, and changes in the pattern of complementary A-T and C-G base pairs reflect the execution of a program. Sets of chemical reactions provide a useful model for reasoning at a higher level about the capabilities and limitations of molecular programs.

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 flavor that arise in this field.

Bio: Dr. Anne Condon is Professor and Head of the Department of Computer Science at University of British Columbia. Her research in the areas of computational complexity and algorithms currently focus on ways to computationally predict nucleic acid structure and on molecular programming - the art and science of writing programs that are realized and executed by DNA or other molecules.   Dr. Condon received her Bachelor's degree from University College Cork, Ireland in 1982, and her Ph.D. at the University of Washington in 1987, and was a faculty member at University of Wisconsin from 1987-1999. She is an ACM Fellow and a Fellow of the Royal Society of Canada. Dr. Condon is also a recipient of the Computing Research Association's Habermann Award for outstanding contributions aimed at increasing the numbers and successes of women in computing research.