

# Physics Colloquium

## Michigan Technological University

March 31 (Thursday) 4:00 to 5:00 pm  
Room 139, Fisher Hall

### The many uses of DNA: examples from biophysics and nanotechnology

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#### Abstract

DNA is an extremely versatile molecule. “Designed” by nature, this polymer plays a central role in biology, carrying the genetic instructions for the development of all cellular forms of life. To fulfill its role, DNA must possess a number of unique properties, and it is those properties which make it attractive for non-biological applications as well. Thus, for example, it has been speculated since some time whether the  $\pi$ -stacking interaction between the bases of DNA could potentially be exploited in molecular electronic devices. Self-assembly properties of DNA could facilitate the construction of objects at the nanometer scale. DNA can be used in conjunction with other systems, for example carbon nanotubes, where it could either be inserted or bind to the surface of the nanotube. While there clearly exists a diversity of ideas for potential applications, there also remain many aspects which have not been fully understood yet: How good a conductor is DNA in different environments? What is the underlying mechanism of charge transfer? How does DNA bind to other systems like carbon nanotubes, and how can one exploit this selective binding mechanism to distinguish between different types of carbon nanotubes? In my talk, I want to give an overview of this exciting field, reviewing selected results of both experimental and theoretical/computational studies, including projects in which I have been involved.

#### Biography



Since 2004, Dr. Ralph H. Scheicher is working as a senior research scientist in the Condensed Matter Theory Group at Uppsala University, Sweden. In May 2004 he received his Ph.D. in physics from the State University of New York at Albany and won the Distinguished Doctoral Dissertation Award there (given to the best thesis in any field in the College of Arts & Sciences). His current research interests lie in *ab initio* studies of various systems involving DNA and in hydrogen storage materials.