UNIVERSITY OF CONNECTICUT

INSTITUTE OF MATERIALS SCIENCE

POLYMER PROGRAM SEMINAR

"Understanding RNA Structure and Function: Prediction, Analysis and Nanodesign"

Dr. Bruce Shapiro
National Cancer Institute

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11:10 AM, IMS Room 20

ABSTRACT

Understanding the structure and function RNA has become a very important area for biological and computational research. This importance stems from RNA's ability to perform a multitude of tasks ranging from being a carrier of information (mRNA), informational translators (tRNA), enzymatic catalysts (ribozymes), structural elements, processing guides (snoRNAs), allosteric sensors (riboswitches) to gene regulators (siRNAs and miRNAs). Our laboratory has been focusing on the research and development of computational methodologies to elucidate the folding characteristics of various forms of RNA. These include methods for predicting the folding of RNA (secondary structure and 3D structure) as well as for interpreting the results that are obtained from various folding algorithms.

In addition, nucleic Acids (DNA and RNA) are becoming very useful modalites for the development of new nano materials that have the potential for major advances in therapeutic applications. Recently RNA itself has been shown to have had a significant impact on the multidisciplinary field of nanotechnology. It constitutes a very intriguing "compromise" between the relatively simple self-assembly principles that are associated with DNA and the diverse structural attributes of proteins. Our research harnesses these properties to enable the design of therapeutic agents to combat cancer and viral diseases. This is being accomplished by the development of computational and experimental methodologies that have enabled the development of functional RNA-based nanoparticles with therapeutic potential.

This presentation will describe some of the computational and experimental methodologies we have developed and show how they have led to algorithms and experimental techniques to elucidate RNA structure and function, and facilitate the design of potential therapeutic RNA-based nanoparticles that we have shown are functional in cell cultures and mouse models.

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