

Siemens Competition

Math : Science : Technology

Regional Finalist

Names: Agni Kumar and Patricia Chang

High School: Milton High School, Milton, GA

Mentor: Dr. Loren D. Williams, Georgia Institute of Technology

Project Title: *Evolution of Eukaryotic Ribosomes* (Biology)

The goal of our research work is to test a model of ribosomal expansion, in which given sites of eukaryotic expansion have conserved structure even if the sequences are widely divergent. It is known that in general, throughout the conserved core of the ribosome, secondary structure and three-dimensional structure of rRNA are more conserved than sequence. We have focused on rRNA expansion sequences, which have been added over evolution to the conserved core through elongation and insertion into pre-existing helices. Here, using both computational and experimental methods, we show evidence of striking conservation of the secondary structures in the expansions of eukaryotic organisms with divergent sequences. For our experiments, we successfully isolated rRNA fragments from the most variable part of the ribosome – Helix 25 Expansion Segment (ES) 7 – for multiple complex eukaryotes. We analyzed the secondary structures of these rRNA fragments through SHAPE, dideoxy sequencing, and capillary electrophoresis. Our results can aid in understanding the function and evolution of the ribosome and can reveal new targets for drug design. As rRNA is the target of several well-known antibiotics, this research could contribute to great advances in the design of specific therapeutics for pathogens.