Can Zeroing In Shine Light on the Rules of Life?
Flow of Biological Information

DNAs → RNAs → Proteins

- DNA-dependent RNA polymerase
- Transcription factors
- Ribosome
- Reverse transcriptase
- DNA polymerase
- DNA ligase
- SSB protein
- RNA-dependent RNA polymerase

DNA Replication → RNA Replication → Protein Replication

Epigenetics

Environments → Synthetic Cells

Cynthia Burrows, University of Utah
1808475 Redox Photochemistry in Genomes of Microorganisms

Nicholas Hud, Georgia Tech
1504217 The Center for Chemical Evolution

Jack Szostak, Harvard University
1607034 Non-Enzymatic RNA Replication

The Central Dogma of Biology

Proteins
Biological, Enzyme-Catalyzed RNA Replication

RNA POLYMERASE

Rewinding of DNA

Coding strand

Unwinding of DNA

Template strand

RNA-DNA hybrid region

Nucleotide being added to the 3’ end of the RNA

NTPs

Polymerase movement

Incoming NTP is attacked at the α phosphate by the 3’ hydroxyl of the growing RNA chain.

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Non Enzymatic RNA Primer Extension

Wen Zhang, Chun Pong Tam, Travis Walton, Albert C. Fahrenbach, Gabriel Birrane, and Jack W. Szostak, *PNAS*, 2017, 114, 7659-64
Non-Enzymatic Viscosity-Driven Nucleic Acid Replication

Redox Photochemistry in Genomes of Microorganisms


Can Zeroing In Shine Light on the Understanding of the Rules of Life?

Mural by middle school students from Atlanta working with members of the Center for Chemical Evolution @ Georgia Tech.