

Jumping hurdles in the RNA world

November 21 2014, by Aaron L. Gronstal, Astrobio.net



An artist's rendering of a Ribonucleic Acid (RNA) molecule. Credit: Nicolle Rager Fuller, National Science Foundation

Astrobiologists have shown that the formation of RNA from prebiotic reactions may not be as problematic as scientists once thought.

One hypothesis for the origin of life on Earth includes a period known as the 'RNA World.' In this scenario, ribonucleic acid (RNA) formed from non-biological reactions before being incorporated into life's first

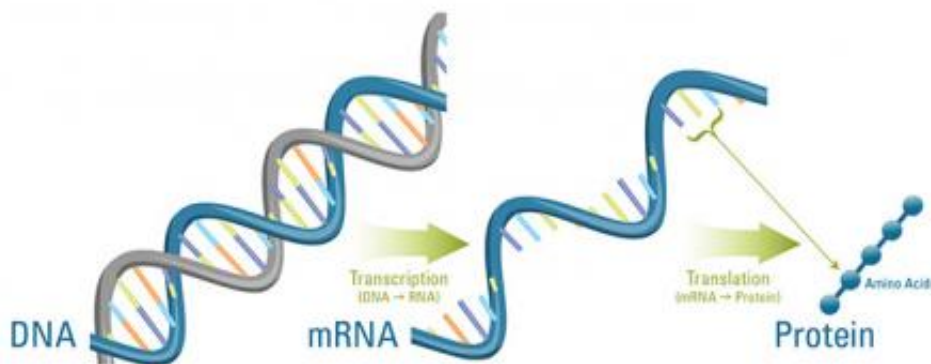
cells.

The study presents a proof-of-concept system that could overcome previously cited challenges to the RNA World hypothesis, and was published in the *Journal of the American Chemical Society (JACS)*.

Information and Motivation

Today, RNA in cells is best known for its role in transferring information in cells, ultimately effecting how genes from DNA are expressed. However, studies have shown that RNA can also play an important role in catalyzing reactions in cells that are necessary for life – in a way similar to proteins that are known as enzymes.

The multiple talents of the RNA molecule make it a prime candidate for use in Earth's first cells. RNA may have provided early life with a means for storing genetic information, and it also could have pushed important reactions along before enzymes were readily available.



A cell's DNA carries the instructions, or genes, to make the proteins that are needed to build cell structures and to perform necessary functions. To make a

protein, the instructions in the DNA are transcribed, or copied to a molecule of messenger RNA (mRNA). Other molecules in the cell then help translate those instructions to assemble the protein by stringing together more than 20 different kinds of amino acids in a specific sequence. Messenger RNA provides vital clues about the processes a cell uses to survive, because it shows which genes are being used at a given time. Credit: Illustration by Katherine Joyce, Woods Hole Oceanographic Institution

Life relies on a complex dance of chemical reactions inside [cells](#). These reactions require a variety of different molecules. A molecule that can perform multiple functions (like RNA) could have been extremely useful in the early stages of [life](#)'s development, and at a time when the huge variety of biological molecules we see today had yet to evolve.

More information: "Spontaneous Prebiotic Formation of a β -Ribofuranoside That Self-Assembles with a Complementary Heterocycle." *J. Am. Chem. Soc.*, 2014, 136 (15), pp 5640–5646 [DOI: 10.1021/ja410124v](#)

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