

# Chemical Evolution of Complex Metabolic Systems

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## Abstract

Investigations were undertaken in which a novel computational chemical model system was created to demonstrate the merging of simple cycles to form complex cycles. As simple cycles evolved, prebiotic conditions must be taken into account (3). One particular topic that has sparked much debate regarding the origin of life is whether or not genes or metabolic cycles came first (4). Geneticists believe that either RNA or an RNA precursor existed first and led to the formation and evolution of metabolic cycles, thus contributing to their complexity. Contrarily, metabolists believe that autocatalytic cycles existed first and over time reactions became more and more complex, therefore causing the formation of metabolic cycles. This research supports the theory stated by Andy Pross (5). According to Pross, it does not matter which came first; rather, the origins of metabolic cycles did not compete with







**Figure 6:** The visual representation of the  $n=3$  complex cycle where  $A$  is representative of the food available in the system for the prey,  $X$  represents the concentration of the prey population, and  $Y$  represents the concentration of the predator population present in the system. As shown above, each simple cycle contained a food supply, prey, and predators that fed into the next simple cycle.

We hope to further investigate our model and develop a more complete understanding of our chemical systems. This will hopefully encourage experimental systems that will provide clues to prebiotic chemistry resulting in simple cycles evolving into complex metabolic cycles on the early Earth.

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