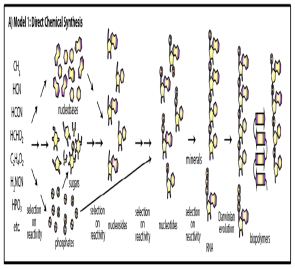


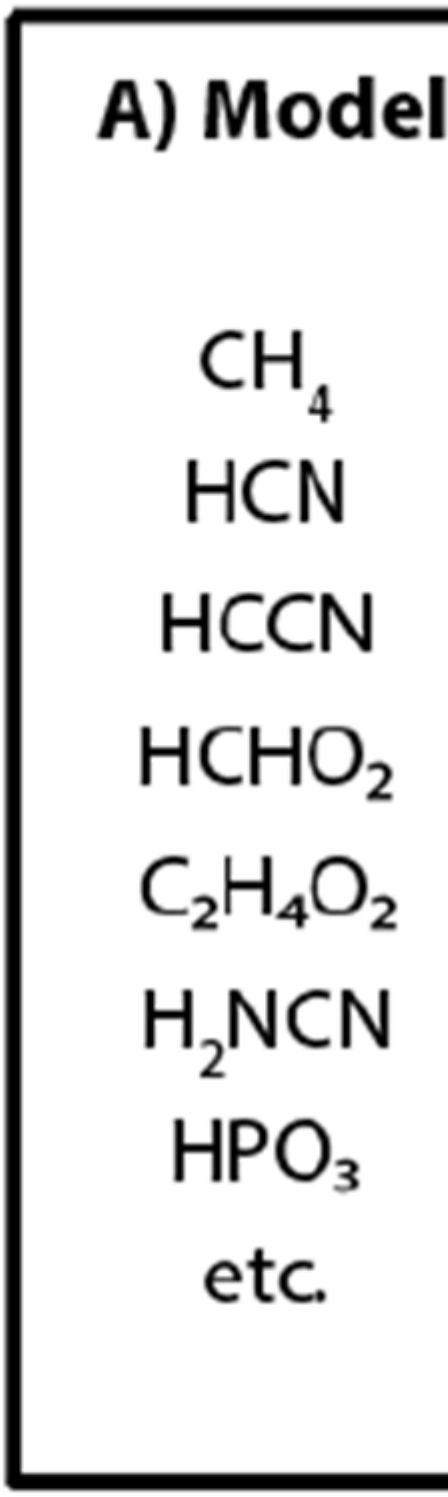
Direct chemical synthesis of RNA, whereby small molecule feedstocks (LH side) enter synthetic pathways that lead to RNA building blocks, then to RNA. This panel was adapted from Benner et al. Variations on ordering of the steps and on the specific chemical reactions and intermediates have been proposed.

Origins of Life: Chemistry and Evolution

Description

Progress in understanding the origins of life is enhanced when models and their predictions are clearly understood and explicitly stated. Two different models can be used to explain the origin of biopolymers during the origin of life. RNA results from inherent chemical reactivities of prebiotic chemical species in one model, which has been pursued for nearly 50 years. RNA invented evolution. This model allows for the prediction that if the conditions of the ancient Earth are sufficiently constrained, chemists will discover the direct synthetic pathways that produced RNA.
A fundamentally different, more recent model proposes that RNA and other biopolymers result from prolonged, creative, selection-driven changes that occurred during chemical evolution, overlapping with early biological evolution. Evolution invented RNA. In this evolutionary model, intrinsic chemical reactivities are not necessarily relevant to the origin of life and do not predict biosynthesis. These two fundamentally different models guide the design of very different experimental approaches to test their underlying assumptions. It is currently undetermined which model, or a hybrid of the two, is closer to

reality.



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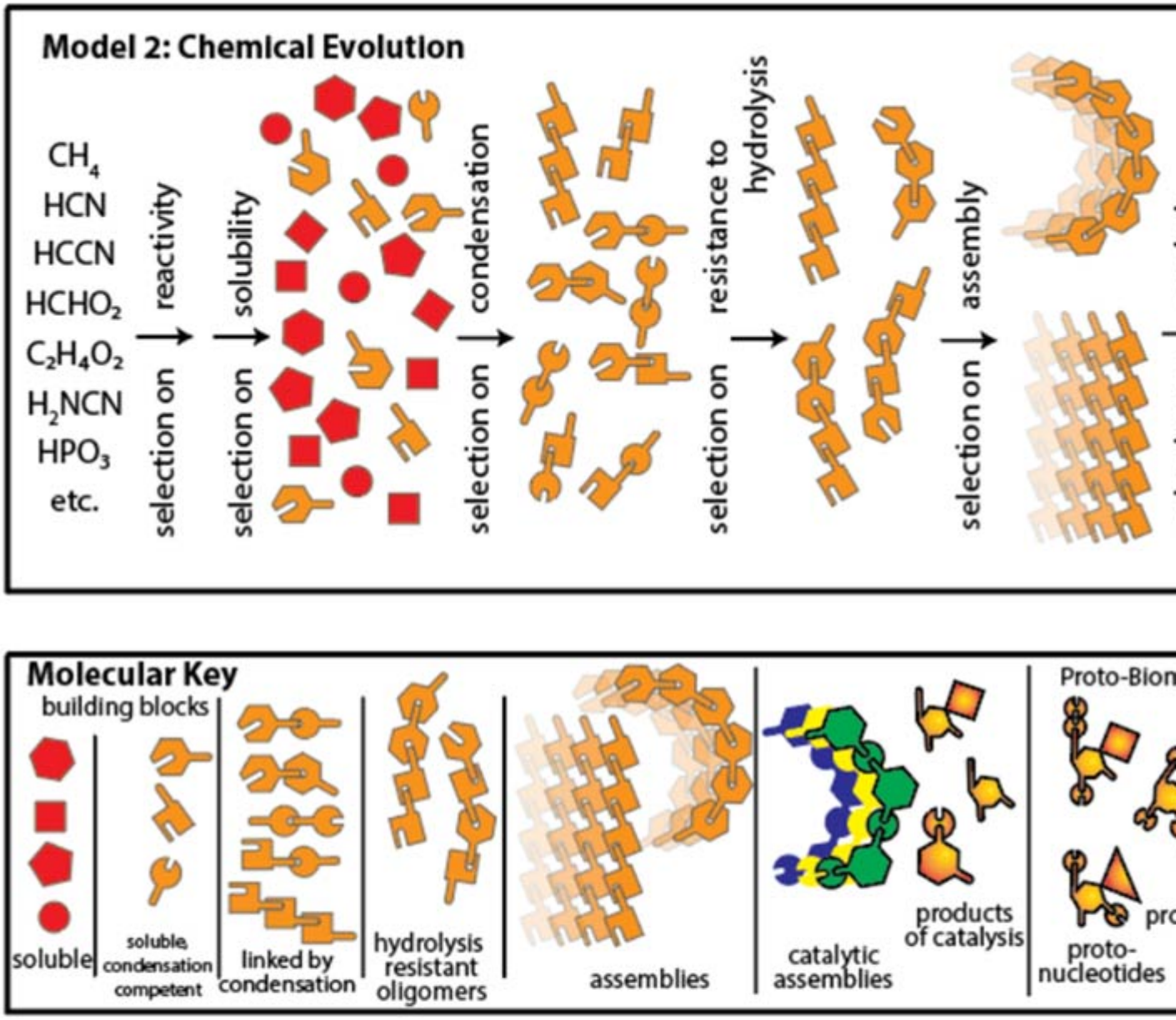
that lead



Chemical evolution, in which energy is harvested from en
by unremitting selection. The basis of selection is f
biopolymers are composed, at least in part, from building
synthesis. The bottom panel is a key explaining the mo
mechanisms of selection such as compartmentalization.
possible drivers of chemical evolution.

Category

1. News