Scientists said to get DNA-like molecule to assemble itself

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Courtesy of Georgia Tech
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Chemists say they have found a way to make a DNA-like molecule assemble itself in a pond-like setting—potentially suggesting a key step in how life originated.

The researchers actually worked with a simpler molecule, called pre-RNA. It's hypothesized to have eventually evolved into DNA—one stopping point along the way having been the creation of a third substance, RNA, still used in the body to translate the code inscribed in DNA.

Scientists had long struggled to show how even pre-RNA, the easiest to build of the three molecules, might have self-assembled. Today they don't need to—they are copied using pre-existing cellular machinery—but the first ones presumably had no such help.

The study demonstrated a chemical reaction "that we see as important for the formation of the earliest RNA-like molecules," said one of the researchers, biochemist Nicholas Hud, who directs the Center for Chemical Evolution at the Georgia Institute of Technology. The study was published Dec. 14 online in the *Journal of the American Chemical Society.*

RNA or pre-RNA consist of three chemicals. Two are ribose and phosphate. The third is called a base, but there are a few possible bases. The three components, in any event, link together to form just one unit of the molecule. The whole molecule consists of many of these units. This allows it to store information, embedded in the specific sequence of bases. DNA is similar to the other two molecules, though it's double-stranded, like a ladder—good for its stability—whereas the other molecules are single-stranded, like ladders cut down the middle.

Hud's team investigated bases chemically related to those of modern RNA, but that might be able to spontaneously bond with ribose and assemble with other bases. They focused on a molecule called triaminopyrimidine, or TAP, which they mixed with ribose under conditions meant to mimic a drying pond on early Earth.

TAP and ribose reacted together with up to 80 percent of TAP being converted into nucleosides, the units of RNA, the scientists reported. "This study is important in showing a feasible step for how we get the start of an RNA-like molecule," and also how the building blocks "could have found each other and self-assembled in what would have been a very complex mixture of chemicals," Hud said.