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## Building Blocks for a Tiny World

By [Kristen Philipkoski](#) | [Also by this reporter](#)

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Scientists at Purdue University have built nanostructures of various shapes and sizes using a substance in the human body that is proving to be an increasingly valuable piece in the biological puzzle.

Ribonucleic acid, or RNA, is best known for shuttling messages from deoxyribonucleic acid, or DNA, to cells. The Purdue researchers programmed RNA molecules to fashion themselves into 3-D spirals, triangles, rods and hairpins, which the researchers say could make good homes for nanoscale machines, according to a report in the August issue of *Nano Letters*.

The researchers hope diagnostic chips, tiny sensors, gene-delivery vehicles and other nanoscale devices will one day be mounted on their structures.

Living organisms already build their own nanoscale structures using proteins, DNA and RNA, so [Dr. Peixuan Guo](#), a molecular virology professor in Purdue's School of Veterinary Medicine, commandeered RNA for his purposes. Guo, who led the study, believes RNA may lend itself best to building nanostructures because it's easiest to manipulate.

In February 2003, Guo discovered that a type of RNA acted as the motor for a bacteria-killing virus called phi29, and he and his colleagues at Purdue built a synthetic version of this motor. The ends of the motor could be targeted to latch onto specific substances, such as molecules, that cause human disease.

Guo used the same synthetic RNA to build the nanoscaffolding. It's a promising development, but even more important will be the nanotechnologies that will go inside the scaffolding, said James Baker, director of the [Center for Biologic Nanotechnology](#) at the University of Michigan, and CEO of [NanoCure](#) and [NanoBio](#).

"I think it's a very nice demonstration of how you can use biological material to build synthetic things, and clearly it has potential," Baker said, "(but) it's

really scaffolding in search of a function."

Although Guo's inventions have been called some of the strongest examples of nanomachines built from DNA or RNA, one potential snag exists: RNA degrades biologically over time. The Purdue researchers are working on ways to make the RNA motors last longer.

They may be able to borrow techniques that others have already developed to make RNA more resistant to degradation. Various companies in a fledgling field called RNA interference, or RNAi, including [Alnylam](#) and [Benitec](#), are trying to use forms of RNA to block disease-causing biological processes. Others are [experimenting](#) with RNA as a way to repair genetic mutations.

"I think there are ways to get around breakdown problems," said Baker, who reviewed the *Nano Letters* paper. "All of these companies that are doing RNA or gene-transfer technologies have developed various types of synthetic RNA."



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