

Re: RNA: Possible Building Blocks For Nanomachines.

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From: Phillip Thorne (thorne_at_underbase.org)

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On 13 Aug 2004, Kadamose <Kada@myway.com> wrote:

><http://www.sciencedaily.com/releases/2004/08/040812052109.htm>

(Phil reads the article.)

>*What's truly interesting about the article is that they address the
>'weakness' of RNA – which is that it tends to degrade biologically
>over time. They claim that they are working on ways to make the RNA
>more resistant to degradation – the main question is,
>[how to do so,] the technical aspects behind it.*

Well, RNA is a biopolymer, and has the same vulnerabilities as protein chains: heat will cause its 3D structure to unravel; appropriate enzymes will chop it apart (at the phosphate-ribose backbone). High-temperature proteins are stabilized by cysteine disulfide bridges, but AFAIK, RNA has only hydrogen bonding to produce secondary (helices, sheets), tertiary and quaternary (multi-chain) structures.

Question not addressed by the release: in what chemical context is Guo trying to stabilize the RNA, and for how long? On a gold substrate, in vitro (test-tube), in vivo (a cell)? For minutes, days or months?

On occasion, researchers have created DNA with exotic bases -- ones other than A, T, G and C. In DNA, these exhibit either two or three hydrogen bonds. Perhaps exotic bases could have four? Or maybe they're just designing the strands to have a greater number of cross-links.

(IIRC, the amount of heat needed to split a double-stranded DNA molecule is a good measure of its length, assuming an average of 2.5 H-bonds per base-pair.)

That's parallel to exotic amino acids in protein engineering, but DNA/RNA is a lot easier to synthesize without enzymes. (I think. I know that building entirely new tRNAs and transferases to handle

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exotic amino acids within a bacterium was a big challenge, but is there a "mechanical" way to synthesize large proteins? Continued interest in recombinant engineering for pharmaceuticals, include "pharm" animals for proteins too large for bacteria to produce, implies not.)

Peixuan Guo works at the Birck Nanotechnology Center at Purdue University. Cripes, that's an ugly URL:

<http://discoverypark.e-enterprise.purdue.edu/wps/portal/.cmd/cs/.ce/155/.s/4271/ s.155/4271>

Well, supposedly he does -- the Birck site's Staff Search doesn't list him, and I can't guess which of the 17 research groups he's a member of.

/- Phillip Thorne ----- The Non-Sequitur Express -----\
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