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## Noncoding RNAs can self-assemble too!

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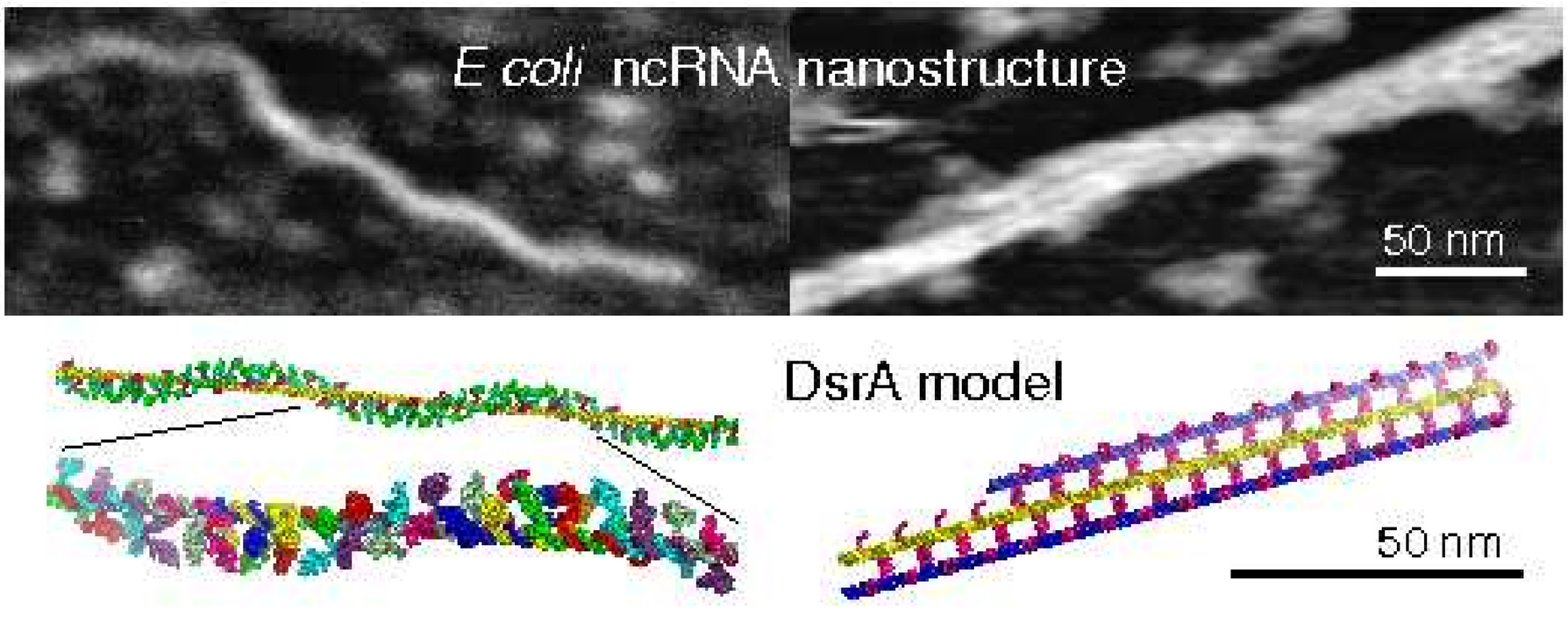
Biological structures and processes rely on specific interactions between biomolecular components of the cell. While the main functions of protein-protein, DNA-protein and RNA-protein interactions have long been recognized, the full extent of RNA-RNA interactions emerged much more recently with the discovery of numerous non-coding RNAs in living cells.

Still, simple RNA-RNA interactions are not known to promote the formation of large RNA self-assemblies, similar to the numeous protein supramolecular structures found in cells, such as protein filaments, microtubules, virus capsids, etc. In fact, this apparent lack of natural RNA self-assemblies is all the more surprising, as many large artificial nanostructures made of DNA or RNA have been successfully designed, opening up promising nanotechnological applications (e.g. 2D and 3D DNA origamis).

Isambert and colleagues have now discovered that DsrA, a small regulatory RNA of Escherichia coli, could indeed self-assemble to form long filaments as well as extended nanostructures, see figure. This hierarchy of nanostructures, first predicted from sequence analysis, relies entirely on antisense interactions of three contiguous self-complementary regions within DsrA sequence. The resulting extended nanostructures, which were subsequently observed using atomic force microscopy (AFM) and fluorescence microscopy, are easily disrupted into >100 nm long helical bundles of DsrA filaments, including hundreds of DsrA monomers, and are surprisingly resistant to heat and urea denaturation. Finally, molecular modelling could demonstrate that this structural switch of DsrA nanostructures into filament bundles results from the relaxation of stored torsional constraints and suggests possible implications for DsrA regulatory function. This finding further extends the already great versatility of natural RNA functions.




PubMed link

Reference:

A nanostructure made of a bacterial non-coding RNA. Cayrol B, Nogues C, Dawid A, Sagi I, Silberzan P, Isambert H. J. Am. Chem. Soc. 131(47): 17270-17276 (2009).