МОРФОЛОГИЧЕСКИЕ АСПЕКТЫ НОВОЙ ФОРМЫ ЖИЗНИ

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MORPHOLOGICAL ASPECTS OF NEW FORMS OF THE LIFE

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An international team of researchers has shown that artificial nucleic acids - called "XNAs" - can replicate and evolve, just like DNA and RNA.

The "X" Stands for "Xeno"

Every organism on Earth relies on the same genetic building blocks: the information carried in DNA. But there is another class of genetic building block called "XNA" — a synthetic polymer that can carry the same information as DNA, but with a different assemblage of molecules.

The "X" in XNA stands for "xeno." Scientists use the xeno prefix to indicate that one of the ingredients typically found in the building blocks that make up RNA and DNA has been replaced by something different from what we find in nature — something "alien," if you will.

Strands of DNA and RNA are formed by stringing together long chains of molecules called nucleotides. A nucleotide is made up of three chemical components: a phosphate, a five-carbon sugar group (this can be either a deoxyribose sugar — which gives us the "D" in DNA — or a ribose sugar — hence the "R" in RNA), and one of five standard bases (adenine, guanine, cytosine, thymine or uracil).

The molecules that piece together to form the six XNAs are almost identical to those of DNA and RNA, with one exception: in XNA nucleotides, thedeoxyribose and ribose sugar groups of DNA and RNA have been replaced. Some of these replacement molecules contain four carbons atoms instead of the standard five. Others cram in as many as seven carbons. FANA (pictured top right) even contains a fluorine atom. These substitutions make XNAs functionally and structurally analogous to DNA and RNA, but they also make them alien, unnatural, artificial.

Any polymer can store information. What makes DNA and RNA unique,is that the information encoded in them [in the form of genes, for example] can be accessed and copied. Information that can be copied from one genetic polymer to another can be propagated; and genetic information that can be propagated is the basis for heredity — the passage of traits from parent to

offspring. In DNA and RNA, replication is facilitated by molecules called polymerases. Using a crafty genetic engineering technique called compartmentalized self-tagging (or "CST"),team designed special polymerases that could not only synthesize XNA from a DNA template, but actually copy XNA *back* into DNA. The result was a genetic system that allowed for the replication and propagation of genetic information.