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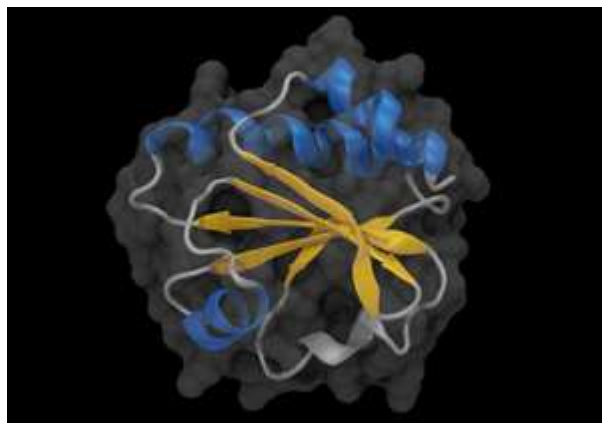
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Researchers resurrect ancient enzymes to reveal conditions of early life on Earth

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By reconstructing enzymes like thioredoxin, shown here in this structural model, scientists can examine the conditions in which extinct organisms lived.

(PhysOrg.com) -- Scientists from Columbia University, Georgia Institute of Technology and the University of Granada have for the first time reconstructed active enzymes from four-billion-year-old extinct organisms. By measuring the properties of these enzymes, they can examine the conditions in which the extinct organisms lived. The results shed new light on how life has adapted to changes in the environment from ancient to modern

Earth.

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In their study, published in the April issue of *Nature Structural & Molecular Biology*, the researchers used vast amounts of genetic data to computationally reconstruct the genes of extinct species, a technique known as ancestral sequence reconstruction. The researchers then went a step further and synthesized the proteins encoded by these genes. They focused on a specific protein, thioredoxin, a vital [enzyme](#) found in all living cells.

Julio Fernandez, professor in the Department of Biological Sciences, and his team conducted a detailed biophysical analysis of the reconstructed thioredoxin enzymes, using an atomic force microscope with single-molecule resolution.

“Given the ancient origin of the reconstructed thioredoxin enzymes, with some of them predating the buildup of atmospheric oxygen, we expected their catalytic chemistry to be simple,” said Fernandez. “Instead we found that enzymes that existed in the Precambrian era up to four billion years ago possessed many of the same chemical mechanisms observed in their modern-day relatives.”

Further examination of the ancient enzymes revealed some striking features: The enzymes were highly resistant to temperature and were active in more acidic conditions. The findings suggest that the species hosting these ancient enzymes thrived in very hot environments that since then have progressively cooled down, and that they lived in oceans that were more acidic than today.

“By resurrecting proteins, we are able to gather valuable information about the adaptation of extinct forms of life to environmental alterations that cannot be uncovered through fossil record examinations,” said Eric Gaucher, an expert in ancestral sequence reconstruction at the Georgia Institute of Technology.

The researchers are now looking to apply their strategy to other enzymes to get a clearer picture of what [life](#) was like on early [Earth](#). Their work could also have applications in biotechnology, where enzymes are playing an increasing role in many industrial processes.

“The unique features we observe in the ancestral enzymes show that our technique could be adapted to generate enhanced enzymes for a wide range of applications,” said Pallav Kosuri, a graduate student and part of the team at Columbia. “If we learn to harness these extinct features, we could potentially improve the efficiency of chemical processes such as the generation of biofuels.”

Provided by Columbia University ([news](#) : [web](#))

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20

Me gusta 35

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Instead we found that enzymes that existed in the Precambrian era up to four billion years ago possessed many of the same chemical mechanisms observed in their modern-day relatives.

Perhaps then we should ALSO consider that the enzymes are relatively modern - only about 6000 years old.

How about comparing the detailed biophysical analysis of the reconstructed enzymes to that of the modern equivalent and report on the differences? Will the modern ones also show the same abilities to survive in acidic environments, etc.

What are the guarantees that they've correctly reconstructed the enzymes from the data that they've gathered?

What are the assumptions made that went into determining that the enzymes came from organisms that are actually 4 billion years old? Who says that they are that old?

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Kevin, bud, you just made my morning.

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"- only about 6000 years old."

No.

"-detailed biophysical analysis of the reconstructed enzymes to that of the modern equivalent
- Will the modern ones also show the same abilities to survive in acidic environments, etc."

They did. As above, they used a computational technique to reconstruct the enzyme. The environment in which this enzyme would have functioned best would have been hot and acidic.

"What are the guarantees that they've correctly reconstructed the enzymes from the data that they've gathered?"

Who needs a guarantee? You aren't buying a car and this isn't even extended as evidence of an old earth. The old earth portion is accepted.

What are the assumptions made that went into determining that the enzymes came from organisms that are actually 4 billion years old? Who says that they are that old?

Assumptions? That thioreductase is a highly conserved AA sequence. Work back with known rates of mutation based on extant similarities.

Your alternative is ?????

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Can we all agree to irradiate young earth creationists when the Global Dictatorship of the Proletariat is established? I'm hoping the old earth creationists will then get the hint and step in line.

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While it might be fun to mock creationists such as kevinrtrs, he is still a person and deserving of compassion. After all, it's not his fault that evolution isn't perfect...

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While it might be fun to mock creationists such as kevinrtrs, he is still a person and deserving of compassion. After all, it's not his fault that evolution isn't perfect...

I'm not so sure. I wonder what would happen to evolutionists under a theocratic regime? Auto da Fay? Shunning?

Creationists and other fantasists shouldn't be killed, but if they are tolerated they will reverse the advances of science, or offer themselves as tools to people who need an audience that believes rather than thinks.

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