Q&A: Poetry in the genes

Canadian poet **Christian Bök** plans to encode his verse into DNA that will sit within the genome of a live bacterium. He tells *Nature* why he wants to create an organism that will translate its own poetic response.

What gave you the idea?

Two essays I read inspired my Xenotext experiment to encode a poem inside the cell of another life form. The first reported a project at the Pacific Northwest National Laboratory in Richland, Washington, by Pak Chung Wong, who theorized that it might be possible to encode information as DNA and embed it in a microorganism. He enciphered lyrics to the Disney tune "It's a Small World (After All)", and was able to retrieve the information after several rounds of cell division. The second essay was by Paul Davies, an astrophysicist and exobiologist at Arizona State University in Phoenix. He speculated that the most efficient way for an alien civilization to make contact across stellar distances would be to send out robot emissaries to colonize the Galaxy, then wait until a sentient civilization could discover them. He suggested that such machines already exist — living cells — so perhaps evidence of extraterrestrial communication is already embedded in the DNA of life. I thought, why wait around? Why not make them right now? So I set about seeing if it was technologically feasible to encode a poem as DNA.

Which bacterium will you use?

The organism has to be robust. I selected *Deinococcus radiodurans*, an extremophile that can survive heat and cold, dehydration and high doses of γ -radiation. And because the organism can repair its DNA very quickly after genetic mutation, it is highly resistant to evolutionary drift.

How will the poem be encoded?

The poem can be most easily encoded by assigning a short, unique sequence of nucleotides to each letter of the alphabet, as Wong has done. But I want my poem to cause the organism to make a protein in response — a protein that also encodes a poem. I am striving to engineer a life form that becomes a durable archive for storing a poem, and a machine for writing a poem — a poem that can survive forever.

Will future generations decode it?

My project is analogous to building a pyramid and then leaving undecipherable hieroglyphs all over it: later civilizations

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Christian Bök hopes that his DNA-encoded poetry will be deciphered by future generations.

may not understand the language, but its presence will testify to the enduring legacy of our own civilization. An alien readership hundreds of thousands of years from now might recognize that such tampering with an organism constitutes evidence of an advanced intelligence trying to communicate.

What will the poem be about?

I don't know yet — I have to let the vocabulary, derived from my chosen cipher, determine what's possible for me to say based on all the constraints of making a functional sequence. I hope the poem won't be a decision so much as a discovery. Language is very robust. Even under duress, it finds a way to say something uncanny, if not sublime. Poets are always trying to write works that 'come alive' — but I'm trying to write a poem that literally is a living thing.

What is the status of the project?

Stuart Kauffman, a genetics professor at the University of Calgary, Canada, is lending me the expertise of his lab. The scientific portion will cost around Can\$20,000 (US\$16,000) and I hope to complete the

work over the next two years. It will form the premise for a poetic monograph. I will also produce a conceptual art show that will include a sculpture of the gene made from toy molecules, and a diptych of images generated through DNA fingerprinting of the microbe.

Might DNA writing have practical uses?

You could 'watermark' genetically engineered organisms to track their movements through ecosystems, or trace the evolutionary progress of disease, or encode a 'user's manual' within the organism itself. I also imagine the technology could be used cryptographically as a convenient, secretive method of transmitting information. I believe that, in the future, we might want to store data in DNA simply because we want to protect our cultural legacy from planetary disasters — and I hope to be among the first poets to make a work of art out of such a burgeoning technology.

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