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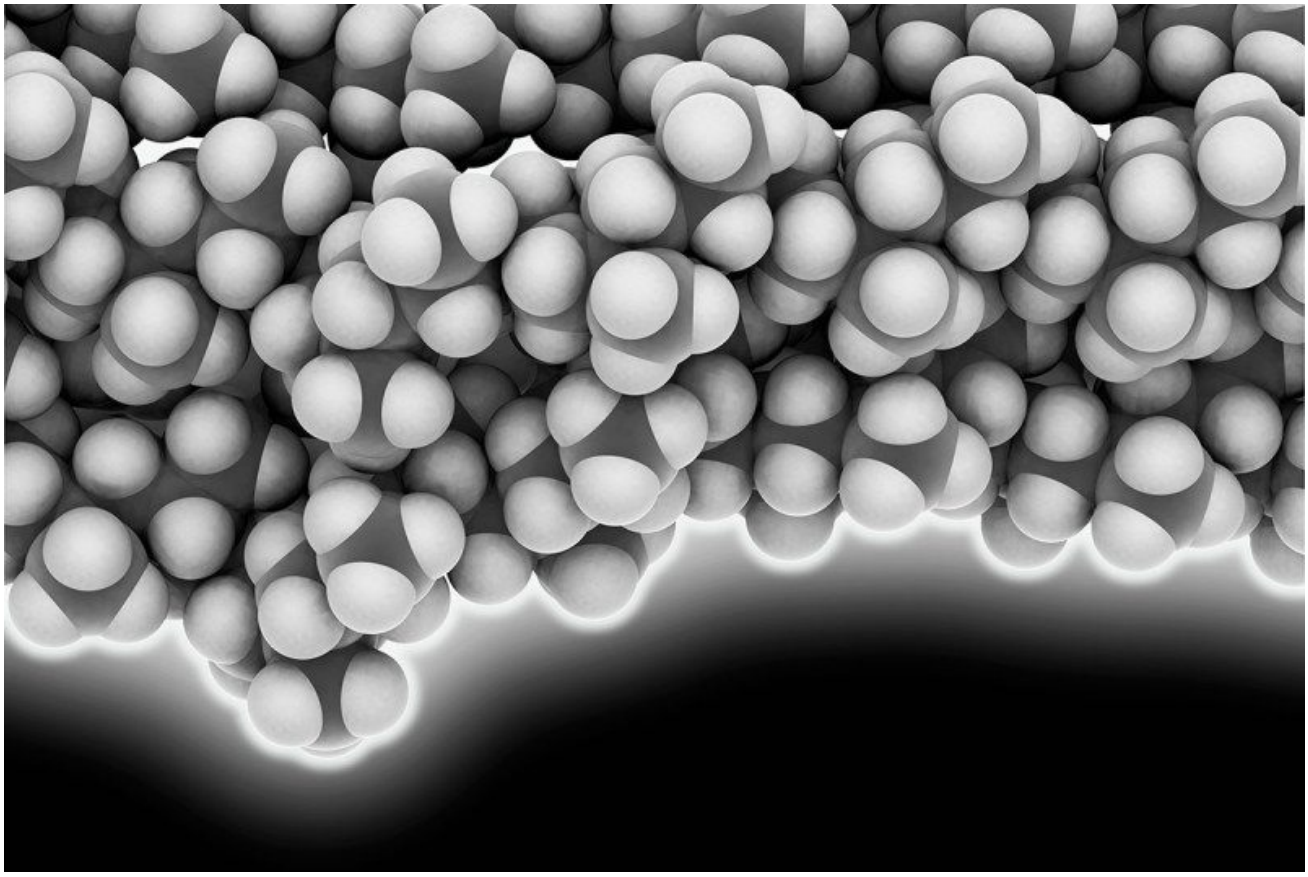
Libraries of plastic molecules could store huge amounts of data



Molecular data storage?
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By **Conor Gearin**

One day your hard drive could just be a pile of plastic. Researchers have coded a word into short chains of plastic molecules, which could be used as a space-saving way to store our mountains of data – or even to reveal counterfeit goods.

DNA has shown some promise in holding millions of bits of information in a tiny volume. But DNA is fragile and hard to write and read. So Jean-François Lutz at the Institut Charles Sadron in Strasbourg, France, has been experimenting with more customisable chains of plastic molecules that can encode information in similar ways.

Also known as polymers, these chains are made up of two kinds of molecules that stand for the 1s and 0s of digital computer code. Previous research has seen data stored in single long chains, but these become harder to read as the length increases, so the storage record stands at just 10 bits.

Lutz's team had a different approach. "Instead of making very long chains, the idea is to create a library of very short chains," he says. As a demonstration, the team wrote the acronym CNRS, the abbreviation for the French National Center for Scientific Research, across six polymers – a 32-bit message when encoded using standard ASCII characters.

The researchers read the message by sorting the chains from shortest to longest using a mass spectrometer and then sequencing the chains by breaking them apart molecule-by-molecule. The shorter chains, less than a nanometre each, are easier to manage than one long one, while their varying length keeps the data in the right order.

"I think it's an encouraging step," says Luis Ceze at the University of Washington in Seattle.

Stolen goods

To store big chunks of information, researchers will have to scale up the technology to make large libraries of chains, Ceze says. In addition, it would be quicker to write data into the molecules if the chains could be synthesised in parallel rather than one at a time, he adds

While writing and reading these polymers is currently expensive, there are some high-end uses for them. Embedding coded polymers in pricey electronics or artworks could label them with the maker's or owner's identity, says Lutz. Reading a sample of the molecule chains would let investigators discover the source of the object, helping them find counterfeits and stolen goods.

Both DNA and synthetic polymers have the potential to shrink the size needed for data storage, says Reza Zadegan at Boise State University in Idaho. That's important, since the world's data is piling up faster than our ability to store it. In 2040, the amount of space needed to keep our data in silicon chips could be as large as a small country, perhaps twice the size of Liechtenstein, he says.

Using several types of molecules would let researchers write in a code that packs more information into shorter sequences than binary 0s and 1s can, says Zadegan. While scientists have introduced two artificial letters into DNA for a total of six letters, it could be simpler to design an entirely new plastic molecule alphabet. "These polymers are perhaps easier to deal with if you want to expand the language," he says.

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