

# Why is the helix such a popular shape?

February 18 2005

---

*Perhaps because they are nature's space savers*

Something about nature loves a helix, the ubiquitous spiral shape taken on by DNA and many other molecules found in the cells of living creatures. The shape is so useful that, while researching the means of creating self-assembling artificial helices, physicists at the University of Pennsylvania believe that they have come across a plausible mathematical reason for why the helical shape is so common. Their findings appear in the Feb. 18 issue of the journal *Science*.

"The classic answer is that helices are helical because the shape is dictated by bonds between molecules. But that only answers how a helix is formed and not why they are that shape," said Randall Kamien, a professor in Penn's Department of Astronomy and Physics. "It turns out that a helix, essentially, is a great way to bunch up a very long molecule, such as DNA, in a crowded place, such as a cell."

In the dense environment of the cell, long molecular chains frequently adopt ordered helical conformations. Not only does this enable information to be tightly packed, as in DNA, but it also forms a surface that allows molecules, such as the machines that enable DNA transcription and repair, to grapple on to it at regular intervals.

To picture how space matters to the formation of helices, Kamien and graduate student Yehuda Snir envisioned the system as a flexible, unbreakable tube immersed in a mixture of hard spheres, analogous to a molecule in a very crowded cell. As they saw it, the space occupied by

the tube is space that could be otherwise occupied by the spheres. They find that the best shape for the short flexible tube is the conformation that takes the least amount of energy and takes up the least space is that of a helix with a geometry close to that found in natural helices.

"It would seem that the success of the helix as a shape in biological molecules is a case of nature working the best it can with the constraints at hand," Kamien said. "The spiral shape of DNA is dictated by the space available in a cell much like the way the shape of a spiral staircase is dictated by the size of an apartment."

Source: University of Pennsylvania

Citation: Why is the helix such a popular shape? (2005, February 18) retrieved 18 April 2024 from <https://phys.org/news/2005-02-helix-popular.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.