

Anti-GMO fear of ‘foreign’ genes? Ferns are latest examples of ‘natural’ genetic modification

One of the central arguments of anti-GMO activists is that genetic modification sometimes results from the movement of “foreign” genes from one species into another species. The contention is this violates some ‘code of Nature’. To your average person, that might still sound creepy. In fact, trans-species gene movement, which is known as horizontal gene transfer, occurs naturally.

Looks like it’s time to add ferns to the list of unnatural abominations created via cross-species gene transfer. (They’re in good company.) The only problem with their membership in the “unnatural” club is that, well, the process by which they became abominations doesn’t involve humans in the least. And it implies that plants may have been borrowing genes from other species since long before the arrival of modern genetics.

A paper this week in the Proceedings of the National Academy of Sciences describes how ferns acquired gene for sensing light from primitive plants called [hornworts](#). Carl Zimmer has written [an excellent account](#) of the study for the New York Times. In brief:

The new research builds on a 2004 study on ferns carried out by [Kathleen M. Pryer](#) of Duke University and her colleagues. They traced the evolutionary history of ferns by [comparing](#) samples of DNA from 45 fern species. The scientists found that roughly 100 million years ago, ferns exploded into a number of new lineages. Eighty percent of today’s fern species can be traced to that evolutionary burst

Intriguingly, these successful ferns also evolved a new kind of light-sensing protein. Known as a neochrome, it makes ferns sensitive to dim levels of light. These neochromes may have enabled ferns to thrive on shady forest floors.

So any time you go traipsing through the verdant undergrowth of a fern-filled forest, it would seem you have genetic modification—of the dramatic, species-hopping kind—to thank.

This study fits into a larger context where our increasing ability to trace the molecular lineages of “natural” species points at a natural history that does not fit well within our conceived boundaries. [What we thought was one ubiquitous species may be several](#) in dire need of conservation. [Sea slugs borrow algal genes](#) to perform photosynthesis. DNA co-opted from viruses that were, in turn, trying to co-opt our own genes for their benefit [may be a key element in how human stem cells work](#).

Because we’ve come to think of genes as the essence of a living thing, something almost akin to a biological soul, we tend to assume that DNA is somehow sacred. Maybe — maybe — there are rare cases where it crosses species lines, but on the whole doing so is some form a sacrilege. But it’s increasingly obvious that this is not the case.

Back to Zimmer's piece:

[Jeffrey D. Palmer, an evolutionary biologist at Indiana University] has found evidence for DNA moving between plant species, as have other researchers in recent years. Those previous studies suggested that plants sometimes replaced one of their genes with a version from another species. "It's like swapping out one part of a machine for another part made in another country," said Dr. Palmer.

And lest you still think the story of ferns borrowing tricks from hornworts is an isolated incident:

The fern study, on the other hand, shows that plants have also gained functions by acquiring new genes from other plants [...] "We're bound to find more," Dr. Palmer said.

Read Carl Zimmer's New York Times article: ["Plants That Practice Genetic Engineering"](#)

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Additional Resources:

- ["Ancient viral DNA may play key role in how human stem cells work,"](#) Kenrick Vezina | Genetic Literacy Project
- ["Solar-powered sea slug harnesses stolen plant genes,"](#) Catherine Brahic | New Scientist
- ["Modern genetics undermines neat boundaries of species,"](#) Kenrick Vezina | Genetic Literacy Project