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Authors: Holmes, Bob

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Abstract: Even the earliest forms of cellular life may have been plagued by viruses. All viruses, including a newly discovered one that is unlike any other seen before, share a common design principle. This suggests these modern viruses also share a common ancestor that appeared before different viruses evolved to infect the three main domains of life, bacteria, archaea and eukaryotes, which themselves began separating at least 3 billion years ago. "Viruses are as old as life itself, if not older," says Mark Young, a virologist at Montana State University in Bozeman, Montana. Young and his colleagues reached this conclusion by studying a virus newly isolated from Sulfolobus solfataricus, an archaean found in acidic hot springs in Yellowstone National Park. The virus has a unique shape and DNA sequence, leading the team to conclude it is only distantly related to all others.

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Viruses have plagued the Earth for 3 billion years

EVEN the earliest forms of cellular life may have been plagued by viruses.

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Young and his colleagues reached this conclusion by studying a virus newly isolated from Sulfolobus solfataricus, an archaean found in acidic hot springs in Yellowstone National Park. The virus has a unique shape and DNA sequence, leading the team to conclude it is only distantly related to all others. They did find more subtle similarities, however. The

protein coat of the virus is composed of 1860 identical building blocks arranged in groups of three. Each of the blocks has a distinctive "beta-barrel" shape, a bit like a carpet rolled up from both ends until it meets in the middle. The beta barrels in turn are arranged in trimers (or groups of three). This pattern closely resembles that seen in bacteriophage viruses and in the adenoviruses that infect eukaryotes (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.0401773101).

This similarity could be the result of convergent evolution — where unrelated organisms solve a problem in similar ways. However, Young thinks it unlikely that viruses would have evolved the same solution three times. "It makes a lot more sense to think they share a common ancestor," he says. And since a variety of descendants of that ancestor now infect cells from the three domains of life, the ancestor probably lived before the split, some 3 billion years ago or more.

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By Bob Holmes

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