Photosynthetic viruses keep world's oxygen levels up

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NEXT time you take in a lungful of oxygen, consider this: it was made possible in part by ocean viruses.

The viruses, which infect single-celled algae called cyanobacteria, are hyperefficient photosynthesisers thanks to a unique set of genes.

Previous work had shown that cyanophage viruses have some photosynthesis genes, apparently used to keep the host cyanobacteria on life support during the infection, which otherwise knocks out the cells' basic functions.

Now Oded Béjà from the Technion-Israel Institute of Technology in Haifa says that the cyanophages' photosynthetic proficiency doesn't stop there. While screening DNA sequences in water samples collected during Craig Venter's Global Ocean Sampling Expedition, his team discovered seven more photosynthesis genes coding for a complex of proteins collectively named photosystem I. They believe the viral complex has a unique shape that makes cyanophage photosynthesis hyperefficient.

The viral complex has a unique shape that makes photosynthesis hyperefficient
In normal photosynthesis, photosystem I grabs electrons from proteins higher up in the photosynthesis chain reaction. The team believe the viral photosystem I genes allow the cyanophages to not only take electrons from the proteins involved in photosythesis but also from other algal proteins.

"We suspect that when these phages enter the cell, they start to replace [the cell's] photosystem," says Béjà. "By grabbing electrons from all sources available at the time, they get more energy out of photosynthesis."

Eric Wommack of the University of Delaware in Newark says the discovery suggests these viruses may play a role in global oxygen production. "Their hosts produce half the world's oxygen and roughly 10 per cent of these cells are infected by cyanophages," he says. "So it is possible that as much as 5 per cent of the world's oxygen production results from cyanophage infected cells."