

# Green plant transport mystery solved

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Contrary to prevailing wisdom, a new study from plant biologists at UC Davis shows that proteins of the Hsp70 family do indeed chaperone proteins across the membranes of chloroplasts, just as they do for other cellular structures.

The findings are published online in the January issue of the journal [The Plant Cell](#).

One of the most crucial tasks in a living cell is to move things across membranes, both in and out of the cell and between different compartments inside.

Chloroplasts are structures inside the cells of green plants that carry out [photosynthesis](#). Like [mitochondria](#), which generate energy for the cell, chloroplasts are thought to be descended from a free-living organism that took up residence in an ancestral cell, bringing photosynthesis with it.

Hsp70s are known to act as 'chaperones' that escort proteins across membranes within cells, including mitochondria. But Hsp70 did not appear to work in the same way in chloroplasts, where a different protein called Hsp93 seemed to fill the chaperone role.

Research scientist Lan-Xin Shi and Steven Theg, professor of [plant biology](#), used the moss *Physcomitrella patens* to study the Hsp70 proteins in chloroplasts. Unusually for a plant, *Physcomitrella* repairs its DNA in such a way that specific [genes](#) can be selectively "knocked out,"

much as they can be in a laboratory mouse.

Shi and Theg found four genes that encode chloroplast Hsp70s in the moss. Knocking out one of these genes, Hsp70-2, killed the plant. Moreover, reducing protein levels of Hsp70-2 resulted in reduced protein import into isolated chloroplasts.

The results show that principles used in the transport machineries of chloroplasts, mitochondria and other cellular bodies have been conserved through evolution, Theg said.

"I always wondered why it was different in chloroplasts," Theg said. "This opens the possibility that the mechanism works the same way in all these cases."

Provided by University of California - Davis

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