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## Shelf Life



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## Salamander Symbiosis Stresses Green Algae

by AMNH on 05/02/2017 10:35 am

### RESEARCH POSTS

Spotted salamanders and green algae make for an odd couple, but they share a close bond that begins when the algae start growing in the salamander's egg. Just because it's an intimate arrangement, though, doesn't mean it goes smoothly for both parties, [a new study by Museum scientists](#) shows. While salamanders seem to take the connection in stride, it leaves algae cells struggling to get by.



The spotted salamander fosters a unique relationship with a green alga.  
© AMNH/E. Chapman

This rare "cellular roommate" relationship between two very different species—which you can learn about in [this episode of the Museum's Shelf Life](#) (<http://www.amnh.org/shelf-life/episode-11-green-grow-the-salamanders>) web series—has intrigued scientists for decades. That's in part because, while algae are known to form similar relationships with invertebrates like corals and cicadas, this is the only algae symbiosis that involves a vertebrate species.

"Science shows us the many ways that life is interconnected, especially on the microscopic level, where we see how many organisms depend on close contact with or internalization of other species for food, defense, or reproduction," said lead author John Burns, a postdoctoral researcher in the Museum's [Division of Invertebrate Zoology](#). "But the relationship between this particular alga and salamander is very unusual."

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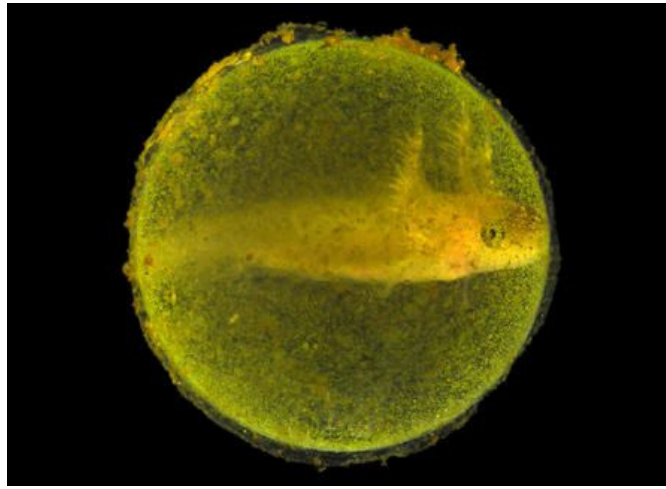
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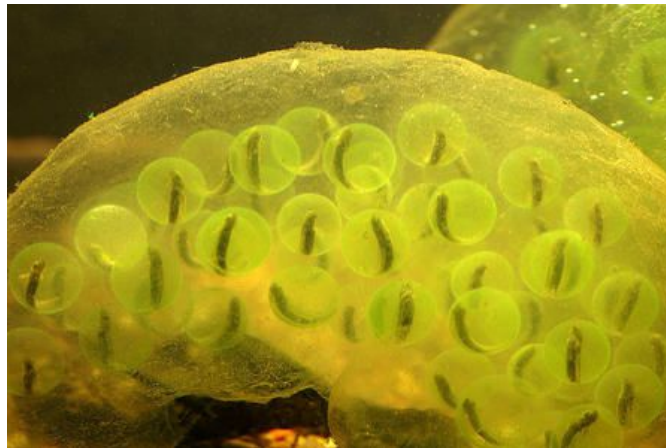


A single spotted salamander embryo in an egg.

© R. Hangarter

The alga species *Oophila amblystomatis* grows in the egg cases of the spotted salamander *Ambystoma maculatum*, a strange pairing that is visible to the naked eye thanks to the green hue it gives the salamanders' eggs.

"This is really such a strange arrangement. It would be like having a bunch of green algae in a womb," said study co-author Ryan Kerney, an assistant professor at Gettysburg College. "What we set out to look at now is the kind of molecular change that happens when the salamander cells and green algae cells are together."



Developing embryos are encased in eggs that are green due to the presence of symbiotic algae.

© R. Hangarter

The findings of the new study, published today in the journal *eLife*, suggest that algae inside salamander cells are stressed and change the way they make energy. Instead of using light energy to produce food to support the salamander host, as happens in coral-algae interactions, the algae in salamander cells struggle to adapt to their new environment. It's not clear if or how the algae benefit from this arrangement.

In stark contrast, affected salamander cells appear to recognize the alga as foreign, but show no signs of stress. The researchers found that the salamanders overexpress several genes that might suppress an immune response, suggesting that the host cell experience is neutral or beneficial.



Algae are clearly present in these spotted salamander eggs.

© AMNH/E. Chapman

“We are learning that these two fundamentally different cells are changing each other dramatically, and this might be relevant for other symbiotic systems, including human and parasitic bacteria relationships,” said study co-author [Eunsoo Kim](#), an assistant curator in the Museum’s Division of Invertebrate Zoology.

To learn more about the special relationship between these two species, and how Museum researchers are trying to understand it, check out this episode of Shelf Life.

Tags: [salamander](#), [invertebrate zoology](#), [algae](#)

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