

Flapping baby birds give clues to origin of flight

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A nine day-old chukar chick is righting itself using asymmetric wing flapping and rolling after being dropped upside down. Credit: Dennis Evangelista

How did the earliest birds take wing? Did they fall from trees and learn

to flap their forelimbs to avoid crashing? Or did they run along the ground and pump their "arms" to get aloft?

The answer is buried 150 million years in the past, but a new University of California, Berkeley, study provides a new piece of evidence – birds have an innate ability to maneuver in midair, a talent that could have helped their ancestors learn to fly rather than fall from a perch.

The study looked at how baby birds, in this case chukar partridges, pheasant-like game birds from Eurasia, react when they fall upside down.

The researchers, Dennis Evangelista, now a postdoctoral researcher at the University of North Carolina, Chapel Hill, and Robert Dudley, UC Berkeley professor of integrative biology, found that even ungainly, day-old [baby birds](#) successfully use their flapping [wings](#) to right themselves when they fall from a nest, a skill that improves with age until they become coordinated and graceful flyers.

"From day one, post-hatching, 25 percent of these birds can basically roll in midair and land on their feet when you drop them," said Dudley, who also is affiliated with the Smithsonian Tropical Research Institute in Balboa, Panama. "This suggests that even rudimentary wings can serve a very useful aerodynamic purpose."

The nestlings right themselves by pumping their wings asymmetrically to flip or roll. By nine days after hatching, 100 percent of the birds in the study had developed coordinated or symmetric flapping, plus body pitch control to right themselves.

"These abilities develop very quickly after hatching, and occur before other previously described uses of the wings, such as for weight support during wing-assisted incline running," said Evangelista, who emphasized

that no chukar chicks were injured in the process. "The results highlight the importance of maneuvering and control in development and evolution of flight in birds."



Chukar partridge chick 1-2 days after hatching.

The researchers' study appeared Aug. 27 in the online journal *Biology Letters*, published by the Royal Society.

Dudley has argued for a decade that midair maneuverability preceded the development of flapping flight and allowed the ancestors of today's birds to effectively use their forelimbs as rudimentary wings. The new study shows that aerial righting using uncoordinated, asymmetric wing flapping is a very early development.

Righting behavior probably evolved because "nobody wants to be upside down, and it's particularly dangerous if you're falling in midair," Dudley

said. "But once animals without wings have this innate aerial righting behavior, when wings came along it became easier, quicker and more efficient."

Dudley noted that some scientists hypothesize that true powered flight originated in the theropod dinosaurs, the ancestors to [birds](#), when they used symmetric wing flapping while running up an incline, a behavior known as wing-assisted incline running, or WAIR. WAIR proponents argue that the wings assist running by providing lift, like the spoiler on a race car, and that the ability to steer or maneuver is absent early in evolution.

Such activity has never been regularly observed in nature, however, and Dudley favors the scenario that flight developed in tree-dwelling animals falling and eventually evolving the ability to glide and fly. He has documented many ways that animals in the wild, from lizards and lemurs to ants, use various parts of their bodies to avoid hard landings on the ground. Practically every animal that has been tested is able to turn upright, and a great many, even ones that do not look like fliers, have some ability to steer or maneuver in the air.

Contrary to WAIR, maneuvering is very important at all stages of flight evolution and must have been present early, Evangelista said. Seeing it develop first in very young chicks indirectly supports this idea.

"Symmetric flapping while running is certainly one possible context in which rudimentary wings could have been used, but it kicks in rather late in development relative to asymmetric flapping," Dudley added. "This experiment illustrates that there is a much broader range of aerodynamic capacity available for animals with these tiny, tiny wings than has been previously realized."

The researchers also tested the young chicks to see if they flapped their

wings while running up an incline. None did.

More information: Ontogeny of aerial righting and wing flapping in juvenile birds, *Biology Letters*, [rsbl.royalsocietypublishing.org ... /8/20140497.abstract](https://royalsocietypublishing.org/doi/10.1098/rsbl.2014.0497)

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