



# Press release

## Carrion crows can learn precise tool use

**A research team at the University of Tübingen demonstrates experimentally how crows learn to dexterously handle a stick with their beak and use it for precise food retrieval**

**Christfried Dornis**  
Director

**Janna Eberhardt**  
Research reporter

Phone +49 7071 29-77853  
janna.eberhardt[at]uni-tuebingen.de

presse[at]uni-tuebingen.de  
www.uni-tuebingen.de/aktuell

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Animal training can teach carrion crows to use a stick tool to retrieve food. With increasing practice, they not only demonstrate great skill and achieve their objective in a few steps, they also respond flexibly to varying conditions in the experiment. These were the findings from behavioral experiments with tame birds by Dr. Felix Moll, Julius Würzler and Professor Andreas Nieder from the Institute for Neurobiology at the University of Tübingen. Carrion crows do not habitually use tools in the wild. However, the researchers surmise that only modest evolutionary changes would suffice to turn them into habitual tool users, even without special training. Their study has been published in *Current Biology*.

“Tool use is very rare in the animal kingdom but relatively common in dexterous generalists such as primates, parrots and corvids,” reports Felix Moll. Only two of the roughly 40 species of crows use tools regularly: the New Caledonian crow and the Hawaiian crow. Crows are songbirds with exceptionally large brains and complex behaviors. The inherited motivation of New Caledonian crows to use objects as tools has fascinated researchers for a long time, he says. “The motor-cognitive skills underlying this behavior such as the level of cause-and-effect understanding and the precise but flexible motor control have not yet been studied in depth.” The research team wanted to investigate whether another species of crow can in principle grasp the use of tools just as well – and how learning shapes the necessary skills.

### High demands

For the study, the researchers first trained three carrion crows to pick up a stick in their beak. In the next step, the crows learned by trial and error to retrieve food pellets from a transparent Plexiglas box using a stick; they could not reach the pellets with their beak alone. Also, if the pellet was guided out too quickly, it could fall off the setup table, out of reach of the bird. The birds’ training sessions were documented by recording the

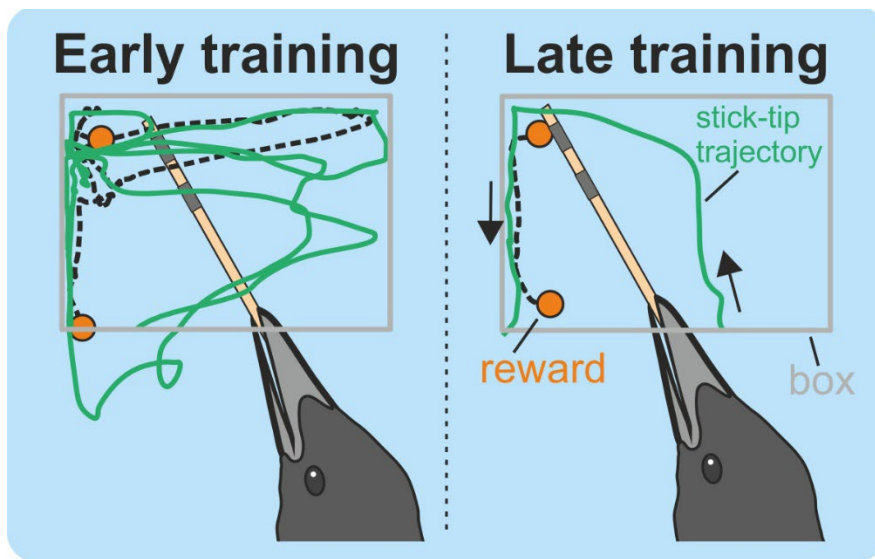
movements of the tip of the stick. “The crows first picked the stick from a holder and adjusted it until they were grasping the stick such that it was precisely aligned with their beak, then they used it to guide the pellet within reach. During pellet manipulation, they closely observed how the stick-tip affected the pellet to correct any mistakes immediately,” said Moll, explaining the actions of the trained carrion crows. They only ate the food once they had returned the stick to the holder.

The recordings of early training sessions show how the birds start with broad, lunging movements of the stick which often only shoved the food pellet back and forth, requiring many attempts until they could reach it. “By comparison, recordings of later training sessions show extremely precise movement patterns. The movements of the stick vary little in the standard situations, the crows determinedly guide the food pellet to one side of the box and fish it out,” reports Julius Würzler. At the same time, the birds are completely flexible if, for example, they drop the stick.

“Animal tool use is supported by a number of enabling factors,” remarks Andreas Nieder: “Motivation, conceptual knowledge and advanced cognitive skills, as well as fine motor control.” The carrion crows already met many of these requirements, and were able in the experiment to select effective strategies from a broad range of movements and deploy the tool as an extension of their body. “If woodpeckers didn’t already – with their highly-specialized long tongues – fish beetle larvae out of their burrows in dead wood, this nutritious source of protein might one day be exploited by carrion crows using tools,” Moll adds.



A carrion crow neatly guides a food pellet out of a Plexiglas box using a stick as an extension of its beak. Photo: Felix Moll



Typical stick-tip trajectories during an early and late training session. The crow can't reach the food reward without the stick-tool. Artwork: Felix Moll

**Publication:**

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**Contact:**

Dr. Felix Moll  
 University of Tübingen  
 Institute for Neurobiology – Animal Physiology  
 Phone +49 7071 29-74835  
[felix.moll\[at\]uni-tuebingen.de](mailto:felix.moll[at]uni-tuebingen.de)