

CONDITIONED RESPONSES IN CROWS

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THE following experiments were designed to determine the rôle of traditions in the well-known mobbing behavior of the Common Crow, *Corvus brachyrhynchos*, toward owls.

The extensive literature on enemy recognition in birds has been reviewed by Nice (1943) and need not be reviewed here. It is sufficient to note that since the experiments of Thorndyke (1899) some students have held to the position that the inherent fear responses of birds are generalized. Others, such as Lashley (1938), have taken the position that just as birds have an innate perceptory pattern of the nest characteristic of the species so they may also have an inherent pattern of certain enemies. Lorenz (1935) found that his Jackdaws, *Corvus monedula*, had to learn what to fear from their parents or from other members of the social group. Nice and ter Pelkwyk (1941) reported that Song Sparrows, *Melospiza melodia*, showed moderate alarm at all the mounted birds used, including Hornbills, *Bucerotidae*, and Grouse, *Bonasa umbellus*, and strong alarm at the Barred Owl, *Strix varia*. They also found that Song Sparrows had to learn to recognize cats and Cowbirds, *Molothrus ater*, as enemies. Rand (1941) found that his hand-reared Thrashers, *Toxostoma curvirostre*, regarded owls as objects of curiosity until they moved. From such extensive experiments Rand (1942) was led to suggest that mobbing behavior represents a conflict between two opposing tendencies: the tendency to flee (fear) and the tendency to approach (curiosity). Lack (1941) made essentially the same suggestion with the exception that he emphasized the tendency to attack as one of the conflicting impulses.

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The object of this experiment was to determine the extent to which the behavior of the two species studied might be modified. In this experiment two crows were taken from their nest and reared by hand. Crow A, which was the most precocious of the brood, was taken when only a week old. Crow B, which was the least precocious of the lot, was taken a week later. These crows were kept in a bushel basket



CROW BEGGING FOOD FROM BARRED OWL

beneath mounted specimens of a Barred Owl, *Strix varia*, and a Cooper's Hawk, *Accipiter cooperii*. When they left this improvised nest at the age of approximately five weeks they were placed in a pen with a live owl that was approximately eight weeks old. When the two species were placed together neither showed any noticeable alarm and two days later they were all found to have taken refuge from the rain in the same box. They usually roosted a foot or more apart and not immediately beside each other. The only type of aggressive action that was observed in this stage of the experiment was first noticed when the two species were settling down for the night. On this occasion, Crow A perched immediately beside the owl first on one side and then on the other, meanwhile walking up and down and jumping back and forth over the owl. At this time the two species had been together for three weeks. This more restless activity also resulted in attacks by the owl on other occasions when the crows approached closely.

When the two species had been together for one week, Crow A was observed begging food from the owl—opening his mouth, quivering his wings and calling (Plate 14). He persisted in this behavior for three days and at intervals thereafter for 3.5 weeks. As the owl at this time was being force-fed ground horse meat and as the crow had previously been observed pecking scraps of food from around his mouth, this begging behavior does not necessarily mean that the crow mistook the owl for its parent. Later experiments indicated that this response might be evoked by the sight of food alone. It would seem to be, however, a clear example of what Lorenz (1935) terms instinct interlacement, that is, the behavior here is clearly composed of an inherent motor element directed at an acquired object.

Both crows developed a difference in response to different foods. By the time he was eight weeks old, Crow A would not eat bread and would rarely beg at the sight of it, though, at the same time, he would beg at the sight of meat. Both crows would continue to beg for meat, even when satiated, and hide it in crevices about their pen. Sometimes they would cover it with a bit of paper or feather. These responses continued for the three months of the experiment.

When the two species had been together for 51 days, the owl was moved temporarily to another pen. During this interval the reaction of the crows toward mounted specimens of seven species of hawks and owls was determined. The mounted birds were attached one at a time to the crows' favorite roost and left for intervals of one hour. Both crows at first showed marked alarm at the presence of the mounts, screaming when they were brought into the pen, panting, and flying to

the other end of the pen. By the third test it was noticed that Crow A, but not Crow B, could be enticed immediately beside the mounts with food, and by the seventh test neither crow showed alarm at the presence of any of the mounted specimens including species that they had previously avoided. They would frequently alight immediately beside the mounts and sometimes probe gently at their feathers. This exploratory pecking indicates that they regarded the mounts as objects of curiosity and not as indifferent objects.

These tests occupied 17 days. Immediately thereafter the live owl was returned to the pen for 90 minutes. Both crows immediately flew beside the owl, quivering their wings and calling loudly. They persisted in this behavior during the entire period in spite of the fact that the owl took up several positions in the pen and snapped at them repeatedly. It was not observed what released this behavior on the part of the crows. This behavior represented the closest approach to mobbing behavior ever observed but here it was greatly modified. The wing quivering of the crows toward the owl might seem to indicate that they had learned to accept the owl as the socially dominant species. All fear of the owl had been removed by the conditions of the experiment. It is also interesting to note that none of the wild crows in the neighborhood responded to these calls.

Two months later the behavior of the crows toward various species of predatory birds was tested as before and with similar results. The crows would frequently light beside the mounted birds and sometimes peck at their feathers. Immediately thereafter the owl was returned to the pen with the crows where he remains to this date.

SUMMARY

Two crows were reared with a Barred Owl. Neither species showed any alarm at the presence of the other, and one crow begged food from the owl for three days and at intervals thereafter for 3.5 weeks. The activity of the crows released pecking behavior by the owl when the crows approached too closely, especially when they were calling simultaneously. After the two species had been together for 51 days, both crows showed alarm at the presence of mounted specimens of seven species of raptorial birds as shown in consecutive tests. They learned not to fear these mounts, and two months later this response remained unchanged.

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