

These are made with a high quality (no preservatives) whole wheat bread with a spread of thoroughly cooked hard-boiled eggs (including the shell), cooked brown rice and a 7-grain cereal. After processing the rice, cereal and eggs, we add whole, cooked, fried beans or peas and raisins to the spread. As we distribute the sandwiches, we check the nest boxes and carefully observe each bird for any signs of behavioral change.

The birds do love to see us coming with the piled-high tray of sandwiches. Interestingly, our birds make a fetish of separating the whole raisins and beans before eating the sandwich.

#### Eggs at Last

Late in April 1989, we noted the pair of *A. farinosa guatemalae* working the nest box. As time passed, the hen appeared outside the nest box less often, clearly paying attention to the duties of parenthood.

#### Success

On May 5, I discovered the first egg! The sighting of that egg brought excitement and a beautiful feeling. I didn't inspect the nest box again until May 29, when there were positive sounds of a nestling inside the box. On inspection of the nest box, I found a single chick along with two more eggs.

We didn't access the nest box again for 16 days. When we checked the nest box again, we found three healthy, fat babies. We removed the babies from the nest box and started our hand-feeding program.

#### Hand-feeding

We used Lake's Parrot Buffet fibrous powder for the hand-feeding program for the new arrivals. We gradually weaned the fast growing babies using cooked, brown rice; cooked pinto beans; fresh corn; carrots; apple; and Lake's Parrot Buffet pellets; plus the sandwiches.

The chicks were weaned in August, three months after the hatch. Interestingly, these chicks were talking before they were fully weaned.

#### A Favorite

The Blue-crowned Parrot has always been one of our very favorite birds. It is calm, intelligent and has an affectionate personality. The size, color and, most particularly, its large eyes and eye rings are striking to behold. ●

# The Theory of Imprinting

## its implications and ramifications in raptors and all birds

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There is a growing body of evidence indicating that for young birds of many species, including most raptors, early social experience plays a major role in their subsequent sexual preferences. This socialization experience, often referred to as sexual imprinting, has critical implications for captive breeding programs, including those involving the hand-rearing of young by human caretakers, and those involving foster rearing of chicks by parents of closely related species. For example, it has been shown that when young birds of a variety of species are foster reared through the time of fledging, they will subsequently direct their sexual preferences toward the foster species. Further, this preference is *often* irreversible. That is, even large amounts of post-fledging exposure to their own species may not reverse their preference for their foster species. The amount of exposure needed for this imprinting to occur, when this exposure need occur, how irreversible this imprinting is, and whether males and females show the same effect from this experience, may vary from species to species.

Sexual imprinting may be defined as a learning process by which a young bird learns the features of the stimulus (usually members of its own species) to which it will subsequently direct its sexual behavior upon reaching sexual maturity. The learning takes place within a sensitive period which typically ends prior to sexual maturity. In altricial birds such as raptors, this sensitive period ends about the time of fledging. The learning is generally considered to be irreversible. That is, sexual preferences formed during the sensitive period are difficult if not impossible to reverse. Note that irreversibility refers to a *preference*. In other words, if a foster imprinted bird is placed with only conspecifics, it may successfully mate with them, however, if given the

choice between its own species and its foster species, it will choose to mate with its foster species. This issue is of particular relevance to captive breeding programs with raptors. A raptor imprinted on humans might fail to mate with conspecifics when humans are present, but might successfully mate with conspecifics if their human caretakers avoided contact with them. The learning is generally thought to be supraindividual. Bateson (1966) states that sexual imprinting, in fact, involves individual learning, that birds learn the features of its close kin so that it will subsequently mate with similar individuals.

In 1935, Konrad Lorenz, in a paper that was to become a milestone in the study of behavior, emphasized that in some birds the preference of an individual to mate with a member of its own species is subject to learning shortly after hatching. In some species, if a bird is raised by a foster mother, either another species of bird or a human keeper, the bird will become socially attached to the foster mother and, on reaching sexual maturity, will court individuals of the foster mother's species in preference to those of its own species. As examples, Lorenz cited studies of his own and others on ducks, geese, owls, parrots, herons and other birds, including both precocial and altricial species.

The process by which these important and long lasting first social bonds were formed is termed imprinting. To distinguish the early learning of preferences that are tested by the following response to mother objects and the early learning of preferences that are tested in courtship, the former will be referred to as filial imprinting, and the latter as sexual imprinting. Warriner (1963) showed that choice of a mate within a species can be largely determined by early experience, but his work only dealt

with color variants within one species so it did not test the potency of early learning as an isolating mechanism.

This problem was then studied by Schutz (1965, 1971) in waterfowl which showed that young raised by foster parents and then exposed to their own species subsequently tried to pair with the species they had been raised with. The effectiveness of an imprinting experience is partly determined by other predisposing factors (presumably genetic) which remain to be explored.

Probably the most enduring of the characteristics of imprinting pointed out by Hess (1959, 1964) was the observation that a social attachment by the young to an object occurs most easily, and perhaps mainly, during a relatively short period just after hatching. This became known as the critical period, or sensitive period, for imprinting. This optimum age is defined by an increase in imprintability as the animal nears it, and a decrease afterwards.

Brosset (1971), in an extensive investigation of cross fostering in doves, discovered that a majority of the cross fostered young oriented their sexual behavior toward the foster species. Immelmann (1969, 1972), in studies with cross fostering in finches, showed that most of the offspring directed their courtship exclusively or preferentially to their fostering species.

The advantages of imprinting raptors on man have been realized by many for years. Imprinted raptors can be used for educational purposes and research but, perhaps, the best application is captive breeding. Raptors can be trained to copulate with their handlers upon reaching sexual maturity. The social interaction necessary to keep this type of pair bond intact is time consuming but essential. Daily contact either in the mews or by using falconry techniques will keep this pair bond intact. Falconry techniques assure the proper interaction with humans to continue the pair bond. Pair bond maintenance behaviors such as feeding, preening, etc., can be better maintained if the bird is kept under such conditions.

Male raptors that are to be used as cooperative semen donors must become attached to either a coat or a hat for semen collection.

This, again, calls for extensive personal contact with each bird to allow each specimen to form the

strong sexual bond with the handler that is necessary to train the birds to copulate with the handler. A hat, or coat, specially designed for semen collection can be used for this phase of behavior. Consulting recent relevant literature, Weaver (1983) will provide information on these pieces of equipment. When dealing with imprinted raptors for artificial insemination, it would seem that caring for these by classical falconry methods (jesses and leash, daily feedings on the glove, etc.) is the best and most practical method of enforcing the imprinting process. The addition of hunting these birds apparently also fulfills the role of imprinting (Weaver, 1983).

Only in cases where specific uses for human imprinted birds have been seriously thought out in advance should raptors be so imprinted. In no situation should a raptor that is destined for release be human imprinted. This would result in its demise upon release in almost every case. It should also be noted that certain species become very difficult to handle when imprinted. Aggressive human imprints can be a nightmare to manage in captivity and because of this one should carefully consider the uses of these birds before imprinting occurs. Proper management and housing can prevent human imprinting. It is the responsibility of each individual caring for raptors to use good judgement and professionalism when dealing with young raptors to minimize imprinting problems and provide for biologically appropriate imprinting.

#### References

- Bateson, P.P.G., 1966. The Characteristics and Context of Imprinting, *Biol. Rev. Cambridge Phil. Soc.* 41:177-220.
- Brosset, A., 1971. Imprinting. *Chez Les Colombides-Etude Des Modifications Comportamentales Aucours de Vieillesse.* *Z. Tierpsychol.* 29:279-300.
- Hess, E.H., 1959. Imprinting. *Science* 130:133-141.
- 1964. Imprinting in Birds, *Science* 146:1128-1139.
- Immelmann, K., 1969. Song Development in the Zebra Finch and Other Estrildid Finches, pp. 61-74. In R.A. Hinde, ed., *Bird Vocalizations*, Cambridge Univ., Press, London.
- Lorenz, K., 1935. Companions as Factors in the Bird's Environment. *Ornithol.* 83:137-213, 289-413.
- Warriner, C.C., W.B. Lemmon and T.S. Ray, 1963. Early Experience as a Variable in Mate Selection. *Animal Behav.* 11:221-224.
- Weaver, J.D., T.J. Cade, 1983. *Falcon Propagation, A Manual on Captive Breeding.* The Peregrine Fund, Inc. ●

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