Creating the Nation's first BioPark

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Letter from the Desk of David Challinor
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I wrote in my September 1991 Letter about the National Zoo's plans to open its renovated flight exhibit. You may remember the large outdoor aviary adjacent to the Bird House whose 30-year-old structure was in need of repair; the repairs are now finished. Most of us quite naturally associate birds with flight, but I would like to devote this Letter to the unusual characteristics of a group of terrestrial birds called ratites; these birds do not fly.

Ratites generally have long strong legs, an extended thin neck, no preen gland (the source of the oil that is used to clean and waterproof feathers), no feather vanes (the flat part of the feather on each side of the central quill), and a relict or absent wishbone to which is attached big breast muscles needed to flap the wings of flying birds. The Zoo's ratites include ostriches, a cassowary from New Guinea, rheas from Argentina, emus from Australia, and kiwis from New Zealand. All have adapted to being flightless in ways that suggest the convergent evolution of these species. This means that when an environmental niche develops, such as large expanses of short grass prairie or savanna, the birds that evolve from different genetic stock to exploit this niche tend to look somewhat alike. Thus the emus of western Australia, the rheas of the Argentine pampas, and the ostriches of the African plains all not only look similar, but also exhibit remarkably parallel behavior. A common characteristic of ratites is that they can all swim. We do not often think of strictly terrestrial animals such as rheas and emus as good swimmers, but they find rivers and lakes no barrier.

An example of such parallel conduct is the nesting and brooding habits of the ratites. The male ratite builds the nest -- usually a wide shallow depression in the ground -- and the females of his harem come and lay their eggs in it. Only the male broods. Rhea males can incubate as many as 80 eggs and ostriches up to 40; more than that cannot be covered by the brooder and thus fail to hatch.

Once hatched, ratite young, like chicks and ducklings, are precocial. This means that unlike baby birds which stay in their nest, once ratites dry off after hatching, they immediately follow the first moving object they see -- their nest mates, and even more important, their father, whom they join on foraging forays soon after hatching. Thus, these birds are imprinted on their fathers.

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The cassowary, unlike emus, rheas and ostriches, is a forest dweller of northern Australia and New Guinea, but it behaves in many respects like the other ratites, with a difference. Instead of incubating a number of eggs from different females, the male broods the eggs of only one female and cares for the young once they are hatched.

The smallest ratite in the National Zoo's collection is the kiwi, the national bird of New Zealand. More dimunitive (the size of a chicken) than the other ratites, it is a deep forest dweller that evolved in the absence of mammalian predators. Kiwis are quite unlike their other ratite relatives, being nocturnal and having a short neck and a long bill with lateral nostrils at the flexible tip of its bill. Although one kiwi species lays two eggs at an interval of a week or more, the other lays only one enormous egg that weighs 14% of the female's body weight (the equivalent of a 130 lb. woman having an 18 lb. baby). You can thus understand that the pubic bone in the female's pelvis must soften and stretch to a great degree to allow the egg's passage. As in other ratites, the male handles the incubating and the care after hatching.

What can we learn from this unique behavior of male ratites? In most bird species, both parents brood, but there are many other examples, such as the gallinaceous species (chickens, pheasants, grouse, etc.), where only the female incubates the egg. What is the survival advantage of having only one parent brood, and that parent be the male bird? Could it be that so much energy is needed to produce such a large egg (kiwis) or so many eggs in a clutch (rheas) that the female ratite has too little energy left to brood? The male ratite might retain the necessary energy to perform these functions better than the female. There is at least one report of a female ostrich attacking and driving off a jackal, a behavior usually associated with males, while contrary to our expectations, it was the male who moved the chicks out of the way. We may never be able to explain the ratite's reverse behavior of brooding and raising its young, but enigmas such as this are a strong magnet which attracts bright researchers to the discipline of ethology (the study of animal behavior).

Zoos can and do play an important role in the study of ethology because close, convenient observation of behavior is available. The kiwis, for example, have nested and hatched young in their darkened quarters in the Zoo's bird house. Darwin's rheas have nested and successfully raised young in a large paddock (30 acres) at Front Royal. Thus by careful observation in the environment of a zoo, we can learn a great deal about the reproductive strategies of ratites and other birds. We still do not have an unambiguous explanation for the brooding and chick raising behavior of male ratites, but with enough careful research, we may achieve a reasonable interpretation which we can continually review. Thus do zoos provide a long-term environment for scientists to make extended studies of mammals and birds within their boundaries, studies that would be impossible to conduct in the wild.