Science

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Science and the Creator

The cuckoo

David Burges

IN THE BRITISH Isles the distinctive two-note call of a remarkable bird, the cuckoo, has long been an eagerly awaited herald of spring. The mediaeval 'Cuckoo Song' announces:

"Sumer is icumen in,
Lhude sing cuccu";

whilst the English poet Edmund Spenser (*c.* 1552-99) rejoiced that:

"The merry cuckoo, messenger of Spring,
His trumpet shrill hath thrice already sounded".[1]

The European Cuckoo, *Cuculus canorus*, which has the flight and appearance of a small hawk, winters in Africa and arrives in Britain, usually in April, in order to breed.

Cuckoo species, along with the North American cowbirds, are classified as 'brood parasites', because they lay their eggs in the nests of other species and then leave the 'host' birds to rear their young. This may sound a simple procedure, but in fact a remarkable series of special adaptations is necessary for the strategy to succeed. Evolutionary biologists assert that cuckoo behaviour is a product of natural selection, but as usual conveniently ignore the requirement for all of these adaptations to be present together for reproductive success.

A unique reproductive method

The female cuckoo keeps suitable nests under observation until the right stage is reached by the selected host parents. Then, in an operation taking only a few seconds, she removes one of the host's eggs from its nest and replaces it with her own. This may be repeated up to a dozen times in different nests, only one egg being laid in each.[2] Reed and sedge warblers are among the most frequent victims.

Remarkably, in order to deceive the host birds, cuckoos employ 'egg mimicry', so that their eggs look very like the eggs laid by the hosts, even though around ten different host species are commonly parasitised, and cuckoo eggs have been found in the nests of a hundred different bird species, all with varying colours and patterns.[3] How this is achieved by the female bird is apparently still unknown. Researchers speculate that, after migration, cuckoos return to habitats that are similar to those in which they themselves were fledged in order to find hosts from the right species to parasitise. Recent behavioural and genetic research on cuckoo populations in Japan has demonstrated what has long been suspected, that each female cuckoo almost always chooses a single host species.[4]

The role of cuckoo chicks

It might be thought that the cuckoo hatchlings would be passive participants in the reproductive process, but other studies have revealed that this is far from the case. Firstly, cuckoo eggs have unusually strong shells, in order to reduce the chances of puncture of the eggs by small host birds.[5] This, however, means that hatching should be more difficult for the cuckoo chick, but it has

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1. Although the cuckoo appears twice in the AV, in the lists of clean and unclean animals and birds (Lev. 11:16; Deut. 14:15), most modern Bible translations render the Hebrew *shachaph* as 'gull' or 'sea gull'.
2. *The Natural History of the British Isles*, London, 1979.
3. "How do cuckoos find their hosts?", Henry Gee, *Nature Science Update*, www.nature.com/nsu/990128/990128-4.html.
4. "Evolution of brood parasitism in birds, Brooke et al, www.biosci.ohio-state.edu/~eeob/gibbs/evbroodparas.html.
5. "How to hatch from an egg of great structural strength: A study of the common cuckoo", Honza et al., *J. Avian Biol.* 32, pp. 249-55.

been found that it possesses several mechanisms to compensate for this; thus the chick is heavier, has a longer forearm and is equipped with an egg tooth with a significantly lengthened cutting edge, as compared with chicks in eggs of a similar size from another species, the great reed warbler.

After hatching, the cuckoo chick ejects the hosts' eggs or chicks from the nest. And now another remarkable phenomenon occurs. Parent birds normally adjust their feeding rate to the number of chicks in the nest, prompted by their wide-open beaks and brightly coloured gapes. Yet the cuckoo chick, far larger than the parent bird, tricks it into supplying the same amount of food as it would normally provide for a whole brood of its own chicks.

Careful studies of reed warblers by scientists at Cambridge University have found that the parent birds normally respond firstly to the visual prompts of the open beaks to assess the number of chicks, and secondly to their begging calls to assess the degree of hunger.[6] The impostor cuckoo chick cannot reproduce the multiple gapes of the displaced chicks but makes up for it with its begging call. At six to eight days after hatching its rate of call is similar to the reed warbler chicks, but as it grows its repetitive begging call becomes faster and faster, soon becoming much more rapid than the rate achieved by a brood of four warbler nestlings.

When a similar-sized blackbird chick was substituted for the cuckoo in the nest, it received only the same amount of food as a warbler chick, but when a tape-recording of a cuckoo chick's begging call was played close to the nest the parent warblers greatly increased the feeding rate. Thus by this strategy the cuckoo is able to persuade its foster parents to feed it the same type and quantity of food as they would four of their own brood.

Amazing migration

But this is not the end of the wonders of cuckoo behaviour. Since the adult cuckoos are not involved in the rearing of their own young, they are free to leave on their migration back to Africa, and they usually depart in July. The young, however, require longer to accumulate sufficient reserves of fat to fuel the long flight southwards, and so do not depart until much later. They must therefore rely entirely on instinct to find their winter quarters. This also makes it likely that their return to Europe and all of the subsequent breeding behaviour are also instinctive and not learned from parents, as is the case with many other species.

Migration is in any case an astonishing and impressive phenomenon, as reported by the prophet Jeremiah: "Yea, the stork in the heaven knoweth her appointed times; and the turtle and the crane and the swallow observe the time of their coming; but my people know not the judgment of the LORD" (8:7). But the migration of the juvenile cuckoo, completely separated from the parent birds it has never even seen, seems yet more extraordinary.

Programmed learning

The whole reproductive and migratory cycle of the cuckoo requires the presence of a large amount of inbuilt information, incorporating both instinctive and genetic components. The ability of the mother cuckoo to recognise the correct time to substitute her egg, the amazing speed with which she lays it, and its mimicry of the host eggs, are all essential elements. At the same time, the special adaptations of the cuckoo chick to cope with the strengthened egg shell, its unique begging call and its amazing migratory abilities are all equally important for success.

The question is, where did this information come from? To suggest that each of the component features evolved separately and in small stages ignores the evidence that lack of any one of them would impose a major selective disadvantage, to say the least, or even make reproduction impossible. It is quite incredible that chance mutations combined with natural selection could account for the intricate and interrelated attributes utilised by the cuckoo.

On the contrary, they all seem to be intrinsic parts of a carefully assembled system, bearing all the hallmarks of intelligent design by the Creator. Like so many other aspects of the creation, they can both give us pleasure and cause us to marvel at the works of our God. "Praise the LORD from the earth . . . mountains, and all hills; fruitful trees, and all cedars: beasts, and all cattle; creeping things, and *flying fowl* . . . let them praise the name of the LORD: for His name alone is excellent; His glory is above the earth and heaven" (Ps. 148:7,9,10,13).

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6. "Making a din for some dinner", Eleanor Lawrence, *Nature Science Update*, www.nature.com/nsu/990128/990128-3.html.