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D. MIDDLETON/FLPA

Figure 2 | Spot the cuckoo fledging? Monstrous though the young cuckoo is, the reed warbler can't recognize it as an alien and continues to rear it as if it were one of its own.

To test this idea, Shizuka and Lyon presented parents with one sort of chick at the start of the nestling period (the 'referents'), and allowed them to learn the characteristics of these chicks for a day. During the next four days, parents were given test chicks, half of which were from the same brood as the referents and half of which were not, and the chicks' survival was monitored to detect evidence of learned discrimination. The experiment showed that the test offspring that were unrelated to the referents were least likely to survive to independence. A subsequent experiment ruled out the possibility that parents were simply rejecting chicks of the minority type. So parents learn to recognize their offspring by imprinting on the chicks that hatch first and they are inclined to reject any later-hatching chicks that seem odd by comparison. By using their first-hatched chicks as referents, parents are unlikely to mistakenly learn the wrong sort of offspring as their own.

The experiment therefore supports the hypothesis[3] that learnt chick-recognition can evolve only when the learning process is error-free. Although the traits involved in coot chick-recognition remain to be described, classic behavioural studies suggest that both acoustic and visual cues are probably involved. For example, colonially nesting gull and swallow species are not cuckoo hosts, but they risk feeding alien young when their offspring leave the nest and intermingle with other fledglings of the same species[5]. Experiments show that parents start to discriminate against foreign chicks just before their own nestlings become mobile, and they identify offspring by the structure of their calls and by unique plumage patterns on their head[5]. Although American coots are not colonial, their chicks can swim soon after hatching and they occasionally stray onto foreign territories, where they are attacked by adults[6]. Perhaps this means that learnt chick-recognition has evolved in American coots as a general defence against feeding any alien young, rather than as a specific defence against parasitic chicks.

Might cuckoo hosts learn to recognize their nestlings in the same way as American coots? Intriguingly, the eggs of virtually all parasitic cuckoo species hatch in advance of host young[1], and it is tempting to speculate that their shorter incubation periods have been selected to prevent the evolution of learnt nestling-recognition in their hosts. Nevertheless, there is increasing evidence that some hosts can recognize and reject cuckoo chicks[7–9]. The common theme in these diverse studies[2,7–9] is that host discrimination against parasitic chicks can evolve as long as there are mechanisms in place to minimize the costs of accidentally rejecting host young.

Discrimination need not involve learnt chick-recognition[4,8]: unlearned rules of thumb may enable hosts to reject foreign nestlings rather than their own. For example, hosts may avoid exploitation by abandoning offspring that are alone in the nest[4,7], or that take an unusually long time to fledge[8], because these characteristics are reliably associated with cuckoo nestlings. Where there is learnt nestling-recognition, learning that is confined to a sensitive period[2], or guided by an innate template[4], can reduce the chance of error. In this regard, learnt chick-recognition resembles song-learning in birds, which is often confined to periods when an appropriate tutor bird is present and which can be guided by an auditory template that prevents birds from learning the song of the wrong species[10].

The sight of a tiny songbird feeding a monstrous cuckoo chick overflowing its nest (Fig. 2) is one of the most extraordinary in nature. The message emerging from the latest research is that, absurd as it may seem, such behaviour will persist as long as there are no measures to prevent hosts from routinely rejecting their own chicks. ■

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50 & 100 YEARS AGO

50 YEARS AGO

Under New Zealand conditions of sheep-farming, incisors of grazing sheep wear much more rapidly on improved pasture, chiefly ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*), than on the finer native pastures of low carrying capacity. The cause is not nutritional in the generally accepted sense, however. It would rather seem that certain substances in the herbage of 'improved' pastures dissolve the teeth, the process being aided by the abrasive action of the plant fibre. Wear is also increased in mouths with certain undesirable anatomical characteristics which appear to be hereditary in origin.
From *Nature* 16 January 1960.

100 YEARS AGO

The Family and the Nation: a Study in Natural Inheritance and Social Responsibility. By W. C. Dampier Whetham, F.R.S., and Catherine Durning Whetham — It is the duty of preachers of eugenics, a duty conscientiously undertaken by the author ... to educate public opinion in such a way that, aided by the legislation that will then be possible, it will insist on the more rapid multiplication of the desirable components of our society, and aim at the elimination of the rotten parts which now permeate it ... It is a well-known fact that the birth-rate in Great Britain fell from 36 per 1000 in 1876 to 27 per 1000 in 1907. This in itself may give cause for alarm, but the most serious feature of the fall is that it has not been the same in all classes ... As it is, the lowest stratum is as prolific as before, therefore our birth-rate has become selective. The least valuable portions of the population are selected to produce a disproportionately large share of the next generation, by the action of the more valuable portions in bringing about at any rate a partial self-elimination.
From *Nature* 13 January 1910.