are (0,0, . . . , 0), (α,0,0, . . . , 0), . . . , (0,0,0, . . . , α), and we find that for $p=3$, $\alpha=0{\cdot}1$, the first, second and third approximations (corresponding to $n=0$, $n=2$ and $n=3$) are 0·000179647358, 0·000179681042 and 0·000179680855 whereas the accurate result is 0·000179680858. The reciprocals of the proportional errors are about 5,000, 1,000,000 and 60,000,000. For $\alpha=0{\cdot}5$ the reciprocals of the proportional errors are given approximately by the following table

p:	1	2	3	4	5
1st approx.	100	150	200	300	400
2nd approx.	30,000	7,000	8,500	10,000	15,000
3rd approx.	30,000	60,000	90,000	150,000	300,000

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The "Instinct to Teach"

IN a recent interesting communication Barnett[1] discusses teaching in man and other mammals. He points out that teaching by punishment is common among animals but believes that the evidence for teaching by encouragement is weak. He further notes that it is difficult to distinguish between "behaviour which promotes learning of skills by imitation, on the one hand, and directed teaching, on the other", but he does not deal with a third possibility which forms the basis of the educational system of subprimate mammals. This is the creation by the parent of a situation in which the responses of the young automatically lead to their learning.

This type of education is most clearly shown among the Carnivora, where it may be combined with parental encouragement, and the parental behaviour may also show the adjustment in relation to the performance of the pupil which Barnett cites as a criterion of genuine teaching. The most striking examples are the introduction of the young to the eating and killing of prey; the most familiar example, of course, is the domestic cat. Leyhausen[2] describes in detail how the female at first merely brings her prey and eats it in the presence of her young; later she permits them to attack the prey which she has killed; and finally, she brings in live prey and liberates it in the presence of the young and she may summon them by a special call. In the last phase adjustment to the performance of the young is often seen. The mother does not assist or interfere with the efforts of the young to kill the prey, but if it escapes from them she will bring it back. Tigers show comparable behaviour. Schaller[3] saw a tigress pull down a buffalo and leave it to her cubs to kill: when it shook them off, she again felled it and left it to them. Similarly, Kruuk and Turner[4] saw a cheetah bring a live Thomson's gazelle to her cubs and release it before them. Liers[5] describes how a female Canadian otter brings live prey to her young and liberates it for them. He also records that she too gives a special call not only to attract the attention of the kits to the prey but also to entice them into the water.

Whether these "summoning" calls also have an encouraging effect on the young is not known, but I have seen an adult female caracal appear to give vocal encouragement to a 2 month old male kitten (not her own offspring), both kept as domestic pets. The kitten was presented with a killed mouse, his first encounter with whole prey. He had great difficulty in discovering how to deal with this situation and I was not convinced that he even recognized the mouse as potential food: several times he almost abandoned the struggle. The female gave no active assistance but sat and watched him carefully. During the procedure she gave a low mewing call on several occasions, and each time she did so the kitten responded by a clear increase in his efforts. She called thus once when he had actually left the prey, apparently losing interest in it, and he promptly returned and attacked it again.

I have described in detail the way in which the female *Suricata* introduces her young to solid food[6]. This behaviour is particularly interesting. The female had been raised in isolation from conspecifics, but showed the feeding behaviour as soon as the young of her first litter were of suitable age. Her behaviour showed gradual maturation. Its first manifestation was no more than an inhibition of actual eating: the food was picked up, held in the mouth for some time and finally swallowed with apparent difficulty. When fully matured, the pattern consisted of picking up the food (or capturing live prey), holding it in the mouth, carrying it to the young and running to and fro before them. This procedure normally evokes the response of snatching the food, but if her young failed to do this the female would finally lay down the food in front of a youngster. The female quite clearly did not comprehend the function of her own behaviour. Her first retention of the prey in her mouth was not orientated in relation to her young and her fully developed behaviour was shown even when the young were all busily eating from a feeding dish, so that her efforts hindered rather than assisted them.

There is no need to suppose that the female cat necessarily understands what she is about—at least with her first litter—although she may herself subsequently learn what her behaviour is "for". She does not necessarily bring back live prey for her young to kill: she brings it back and they kill it. Just as in *Suricata*, the important change that takes place in the cat's behaviour is a progressive inhibition of her predatory behaviour, working from the terminal stages forwards. The cat first delays her eating until the food has been brought back to the young: later she kills but fails to eat and, finally, she captures but fails to kill. If the prey eludes the young, it at once evokes in the cat the only part of the sequence that has not been inhibited: she responds to the escaping prey by recapturing it.

In such behaviour I believe it is preferable to think in terms of instinctive patterns which produce learning, rather than of the "instinct to teach", which, in any case, has subjective overtones. It is also misleading and anthropocentric to concentrate on the behaviour of the mother. Her responses and those of her young have been selectively tailored to complement each other. The responses of the mother are simply those which provide the correct situation for evoking the developing repertoire of responses of the young who are thus enabled to educate themselves. Although we as adults tend to think first of the parental side of the interaction, there is no justification for projecting this attitude into studies of other species. If we had found it a little easier to study our cats without prejudice, educational theory might have been quicker to appreciate that our own teaching practice should be geared to the developing responses and responsiveness of our young and to see that the "instinct to learn" is at least as important as any "instinct to teach".

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