## VI

## DETOURS WITH INTERMEDIATE OBJECTIVES

In some of the instances described above, there has been quite a long detour to make. Sultan spends considerable time in gnawing the end of a board that he wishes to fit into a hollow tube ; and yet this gnawing of wood at the end of a stick is an activity which, considered separately, is meaningless in relation to his objective. It is not by any means easy for the observer to regard it in this way. What we see is rather, " Gnaw, gnaw, see if it fits into the tube, gnaw, fit, etc.", an objectively-connected sequence. What becomes of the experiment, if we carry this principle a step further ? In the case of simple preparation of a tool, and so in our example, the part " preparing " (gnawing) is still somewhat closely bound up with the further procedure (insertion and employment) by the fact that the auxiliary action has a direct bearing on the tool-material. If we now try to find tests with parts of greater independence, we arrive at experiments in which the animal has to draw into the situation a preliminary " minor " objective, before he can reach his final objective. This auxiliary objective must itself be approached indirectly, if the final objective is to be attained. On the other hand, if the preliminary process, up to the attainment of the minor goal, be considered quite by itself, and apart from what follows, this first detour shows less connection with the final goal and externally can be distinguished as a separate procedure. Experience shows that we get a particularly strong impression of intelligent behaviour when detours are made as

*one* action, which in their separate phases lead so far away from the goal, but which, considered as wholes, correspond exactly to the situation.

(March 26th) : Sultan is squatting at the bars, but cannot reach the fruit, which lies outside, by means of his only available short stick. A longer stick is deposited outside the bars, about two metres on one side of the objective, and parallel with the grating. It can not be grasped with the hand, but it can be pulled within reach by means of the small

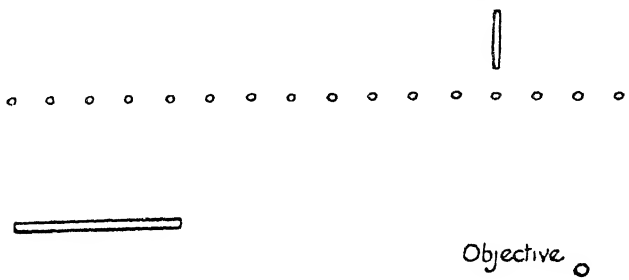


FIG. 12.

stick (see Fig. 12). Sultan tries to reach the fruit with the smaller of the two sticks. Not succeeding, he tears at a piece of wire that projects from the netting of his cage, but that, too, is in vain. Then he gazes about him ; (there are always in the course of these tests some long pauses, during which the animals scrutinize the whole visible area). He suddenly picks up the little stick once more, goes up to the bars directly opposite to the long stick, scratches it towards him with the " auxiliary ", seizes it, and goes with it to the point opposite the objective, which he secures. From the moment that his eyes fall upon the long stick, his procedure forms one consecutive whole, without hiatus, and, although the angling of the bigger stick by means of the smaller is an action that *could* be complete and distinct in itself, yet observation shows that it follows, quite suddenly, on an interval of hesitation and doubt—staring about—which undoubtedly has a relation to

the *final* objective, and is immediately merged in the final action of the attainment of this end goal.

(April 12th) : Nueva was tested in the same manner. The little stick was placed on her side of the bars, exactly opposite to the objective, and the longer stick outside the bars, somewhat nearer than the objective, and about one and a half metres to one side. As Nueva was already at that time seriously indisposed and had very little appetite, she soon gave up her efforts, when she found that she could not angle the fruit with the short stick. Then some specially fine fruit was added to the prize, and she approached the bars once more and gazed around. Her eyes fixed themselves on the larger stick ; she took the little one, drew the larger within reach and secured the fruit. The whole action could not be more distinct and coherent.

Grande was tested at a much later date (March 19th, 1916). She scraped the small stick vainly in the direction of the fruit, then took no notice of the experiment for a time, only to return to it and repeat her efforts with the little stick. Then she sat motionless for a minute by the bars, opposite to the fruit. When her eye fell on the larger stick at the side, she stared at it, but still remained motionless. Suddenly she jumped up, pulled it in with the little stick, and then fetched the fruit in with it. The solution of this experiment is not at all " obvious " : we repeated it a few minutes later, but this time we placed the larger stick in the spot where the objective had been before, only nearer, and the objective in the same place as the big stick in the first experiment, but somewhat further away. Grande again made fruitless efforts with the small stick, and then became indifferent. We called her ; she came up to the bars ; squatted opposite the fruit, and looked about until her gaze was arrested by the longer stick, when she repeated her former correct procedure. It is always a sign of extreme difficulty if a rapid repetition of the test

does not result in a rapid repetition of the solution just found.

When Chica was tested, a mistake was made in arranging the experiment, for while she was making vain efforts with the smaller stick, she saw the other, snatched at it, and actually succeeded in reaching it and with it the fruit. The second time we put the long stick further off; she secured it with the smaller one, and so on.

The less gifted animals of our group showed the value of this achievement more definitely. (April 1st, 1914): Tschego worked hard with blanket, straws, and handfuls of straw to secure the prize, as well as with the little "auxiliary", but, of course, without result. The large stick, which lay a trifle to one side, on free ground, plainly visible and easily accessible by means of the other, was not heeded for a moment, and, after waiting more than an hour, we had to break off this experiment. The same negative result followed a repetition in 1916.

Whereas one might think that Tschego had not "noticed" the long stick, Rana in her experiment had not even this excuse (19.3.16). Clumsily[1], she angled with the auxiliary, and then approached the larger and *stretched her hand out towards it.* Her whole behaviour could thus be expressed in human speech: "I shall not reach the objective with the little stick—outside there is a long stick which my hand cannot reach." She did not for an instant seem to conceive the auxiliary stick (which remained inseparable from the objective) as an instrument for securing the longer stick. Finally I gave her some assistance. In order that she might with greater ease connect the little stick with the long one, I pushed it away from the objective, and nearer to the big stick, while Rana was looking in another direction. I continued this till the small stick was quite close to the big one. *Nevertheless, as soon as Rana had seized the short stick, she hastened back*

[1] There seems to be in apes a high positive correlation between intelligence and dexterity.

*to the point just opposite the fruit,* and angled for it with the totally inadequate bit of wood. The detour " short stick—long stick—fruit "—simply does not arise with this animal. She reminded me of the hens, that persistently charged straight at the wire-netting in front of a coveted morsel, although a very short " way round " would have brought them to it at once ; just in the same way, Rana scrapes and stretches vainly towards the fruit which she could have secured with so much less exertion. It almost seemed as though the short stick were attracted by an unseen but strong force into the primary critical distance " goal—bars ", and therefore did not come into consideration at all for the secondary distance " long stick—bars."

In the next test the fruit was again placed outside the bars ; inside a stick was hung from the roof some distance from the bars and a box placed at one side. The fruit could be reached with the stick, but the stick only through the aid of the box. (4.4.14) Sultan began his treatment of this problem by a foolish mistake, and dragged the box to the bars, just opposite the prize. After moving the box to and fro a while, he left it alone, and began in a more careful way to look about him (obviously seeking an implement), and now saw the stick hung from the roof. At once he made for the box, pulled it under the stick, stepped up, tore down the stick, hurried to the bars, and pulled in the fruit. From the moment he caught sight of the stick, his actions were perfectly definite, clear and continuous. The time that elapsed was at most half a minute—including the angling for the fruit with the stick.

Chica did not arrive at this solution though the stick was hung in position in her presence (April 23rd) and also touched and moved in order to attract her notice. (May 2nd) : The stick was again fastened to the roof, while Chica looked on. She took no notice of it, but tried to reach the fruit with a flaccid plant-stalk and then to tear a plank loose from the lid

of the box; finally she tried to reach the fruit with a straw. Then she appeared to lose interest and began to play with her companion, Tercera; the stick seemed no longer to exist for her. Suddenly some one in the distance called loudly; Chica started and looked round, and, in so doing, caught sight of the stick. Without any hesitation, she went towards it, leapt straight upwards twice, and unfortunately for the purposes of investigation, succeeded in reaching it, as a slight rise in the ground assisted her efforts.

It is to be remarked that, in this case as in Sultan's, the stick was noticed and secured *as an implement*, although some time had elapsed since the objective had occupied her attention. The interval was about ten minutes in the case of Chica, who played with Tercera during this time. Yet, as soon as she perceived the stick, she secured it, her behaviour being not at all influenced by any glance towards the objective.

Immediately after this first test, the stick was hung to another part of the roof, where it was not possible to reach it from the ground. The box remained in the centre of the room. Chica sprang at the stick with indefatigable persistence, but in vain. There was obviously no connection between box and stick for her, for she squatted on the former more than once, to get her breath again, and did not make the least attempt to place it under the stick. But presently the reason became evident; as soon as Tercera, who had been reposing on the box all this time, descended for some purpose, Chica seized it and pulled it forward, mounted it and seized the stick. But when she had it in her hands at last, the major objective was evidently forgotten for a moment, for she stood for a few seconds, turning her back to the bars and the fruit, and gazed at the stick helplessly. But her orientation was renewed without stimulation from without; she suddenly turned round and hastened towards both bars and objective

—clearly so that the turning was already part of the movement towards the objective.

One can hardly assume that Chica had already seen the box as an implement, to be used for the mid-objective (the stick), while Tercera was still lying on it. To judge by the conduct of the animals at other times, she would in that case have tried to remove her friend, by pleading and complaining and by pulling at her hands and feet, and would at least have made an attempt to move the box, in spite of its weight. (Compare also p. 60 above, where a similar predicament arose and the same animals were involved.) It is only when the box is freed of Tercera that it is recognized as an implement; as the seat on which she is sitting is not thus recognized. The experiment also shows that obstinate attempts to gain the mid-objective, although prompted by the desire to attain the final one, can displace this to a certain extent, so that at the end of the minor activity there is a check. On the other hand, the stage of development of the chimpanzee can hardly be better gauged than by the way that Chica finds her way back to the complete problem. She has concentrated for a considerable time on the mid-objective, not throwing even a glance at the major one in the meantime, and then after a few seconds of helplessness, gets back her orientation as if with a start. She remains with her back to the major-objective, so that *nothing external* can cause that start, except perhaps the stick in her hand; and yet the mere sight of the stick is, of course, not enough to account for it. (Compare here Sultan's behaviour in the test with the invisible box, p. 52.)

Much more extraordinary did the relation between major- and mid-objective turn out in the same test, with Koko as the subject of experiment. (31.7.1914) As before, he is confined, by collar and rope, within a circle of about four metres radius; the objective lies on the ground out of reach, and the stick also is placed out of reach above, hanging from

a smooth wall, and the box stands at the side (cf. Fig. 13). Without doubt the experiment starts with a clear solution in sight, for Koko grabs hold of the box at once, and pulls it straight towards the stick on the wall, the use of which, of course, he knows exactly by now. But unfortunately he has to pass the objective on his way, and, as he reaches the spot where this lies in plain view on the ground, he suddenly turns at a sharp angle away from his straight and unmistakable

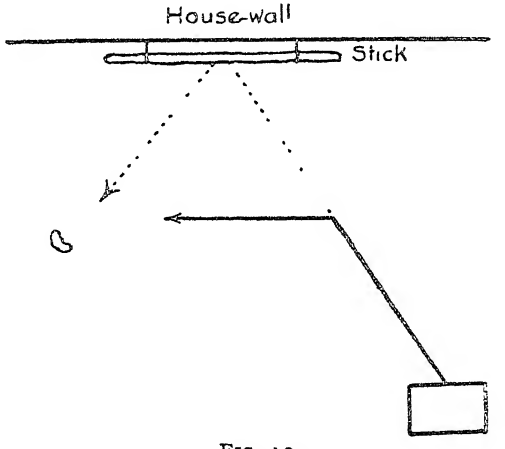


FIG. 13.

path towards the objective, and uses the box as a stick—by letting its upper end fall on the fruit—and then he pulls; this method succeeds. Exactly the same thing happened when the experiment was repeated. Again the box is taken in a straight line from the starting-point towards the stick, and the meaning of his action is indicated plainly enough by his frequent glances towards the mid-objective; but, on passing over into the region where lies the final objective, the animal seems to be turned away sideways toward the final objective, and from this moment the stick on the wall is noticed no more.

The next day the behaviour just described developed to a degree of stupidity familiar enough to us from our ex-

perience with Sultan. The start was right ; but the box, once again dragged towards the stick, could not be got past the final objective. On the contrary, Koko was again diverted from the straight path towards the mid-objective, but instead of using the box as a stick, which would have been fairly sensible, he now pushes it with all his might towards the objective, mounts it, and tries to reach the objective from the top, as if the objective were placed high up ; actually, in this situation, the box is only an obstruction, increasing the distance between the animal and the objective. But this utter stupidity of sitting up on the box and trying to grasp the objective is persisted in for only a few seconds, and the attention is turned anew to the stick on the wall. Yet the box, having once been put aside, is left there, as if consecrated to the final objective ; at any rate Koko takes the greatest trouble to reach the stick without using it.

Comparing this behaviour with that at the beginning of the experiment, the difference is so unexpected that it is necessary to find out now whether the use of the box has not, as once before, been suddenly lost sight of. The stick is taken away and the final objective hung in its place ; Koko reaches for it for a moment, then quickly fetches the box, gets up, is unable to reach the goal, jumps down, corrects the position of the box quickly and neatly, gets up once again, and reaches the objective. According to this, the box simply could not be dissociated from the main or final objective, just as before it could not be got past it, although that time it was already on the path towards the secondary objective. For we must completely exclude the explanation that Koko only understood how to use the box in relation to the fruit, and not to other objectives ; even the beginning of the experiment, when the situation had its effect at once in the sense of "put box under stick", shows clearly that the difficulty is not of so external a kind. Rather it must be a

question of " relative value ", of final and secondary objectives in relation to one another, in the sense that the " stronger " main object can draw away to itself the " auxiliary " action bent on the secondary " weaker " object; while the correct but very indirect path past the secondary to the main objective can arise (beginning of experiment), but is interfered with in that second (as in a short-circuit) in which (at the passing of the region in which the main objective lies) the main objective is dangerously near.[1] In the experiment with Rana described above, the short handy stick is so completely " bound " to the final objective that it is not free for the secondary objective even for a moment, and the parallel here is that the box once connected with the final objective is abandoned as if pre-empted, while Koko cranes himself towards the stick on the wall in vain. (Rana too reached for the long stick only with her free hand).

(6.8) Again the experiment, at first, runs along similar lines. The box is brought as near as possible to the final objective and used as a stick; for some moments Koko mounts it, though this is nonsensical, but only after the animal has, through vain attempts, got into a rage. His excitement gradually increases, he starts hitting and pushing the box with all his might, then lets it go again and turns to the stick on the wall. After he has several times reached up towards it in vain—the box is wedded to the final goal or the critical distance, as before—he at last gives up the job altogether. As the experiment looks hopeless, it is interrupted for a few minutes, and Koko is left alone. When the observer returns, the box is standing under the nail which held the stick to the wall, the stick is on the floor where the objective was before, and this latter is just disappearing into Koko's mouth. The original situation is at once reset, and Koko

[1] I have drawn attention in the Introduction to the theoretical importance of mistakes.

solves the problem without hesitating for a moment, or going off on the wrong path, as before. This was the second experiment of which, after long waiting, I did not see the solution. That this particular test should succeed sooner or later was, of course, to be expected, from his right start at the beginning, and as Koko was completely isolated during my absence—i.e. about three minutes—he must have hit on his solution without outside help. More than this, the repetition shows that it was now completely grasped.

[The day before, a sort of reverse of the experiment had immediately succeeded. The objective hangs from the wall, a stick lies near, a box is placed out of reach. As Koko's arms are very weak, he does not succeed in beating down the objective with the stick; so, after a while, he attacks the box with the stick, pokes carefully with the point of the stick inside the box (which is open on top), tips it over towards himself so that he can reach it with the tips of his fingers pulls it to him, brings it under the objective, and so on.]

If one tries to make the roundabout way still more indirect and difficult, the tendency to leave it for more direct paths or attempts becomes, of course, yet stronger.

(11.5) The arrangement remains the same, but the box is filled with stones. Sultan looks around for a moment notices the stick on the roof, gazes at it concentratedly, goes to the box, and pulls it with all his strength towards the stick. As he can barely move from the spot, he bends down and, takes out one stone, which he carries under the stick; he places the block upright against the wall, but after one look up, does not climb it after all. (Here the stone, which should only have been taken out of the third-class objective (the box), was attracted towards the next objective; in this case the short cut does not hurt.) Thereupon he at once drags the same stone to the bars opposite the end-objective, and tries to push it between them; obviously the stone is to be used

as a substitute for a stick. But, though otherwise practicable in shape and length, it will not go through the bars. The rest is clear and simple: Sultan again turns towards the box, takes another stone out, with difficulty pulls the box (still weighed down with two blocks) under the stick, stands it upright (whereupon the last stones accidentally fall out), takes the stick down, comes to the bars with it, and immediately reaches the objective. The same would have happened from the beginning, if the shorter, but less practicable, paths of action had not arisen so easily and, at least for a time, blotted out other better, but too indirect, roundabout ways.

On the whole, we get the impression that there is no progress to be hoped for from these experiments. Whereas in the examples cited we were able to understand what is happening to the animals, further complications of this kind would probably lead to one "deflection" after another, and so, in the end, make it merely difficult to distinguish the behaviour observed from simple trial-and-error conduct. It is only when one has carried out many intelligence tests on the apes that one learns to avoid with real dread this vague border-land.