of necessity, which means that their instinctive behaviour is not wholly subordinated to a previously established sequence of its constituent acts.

Detailed study of species innate behaviour (in solitary wasps, spiders, drayfish, fish, and other animals) thus indicates that it in no way consists of unalterable chains of movements fixed by heredity, the individual links of which automatically follow one after the other, but that each of these links is evoked by certain sensory signals, so that the behaviour as a whole is always governed by the given actual conditions and can be altered considerably.[11]

Even more obvious is the fact that animals' so-called individual behaviour is shaped in turn on the basis of species instinctive behaviour and cannot otherwise arise. This means that just as there is no behaviour completely performed by innate movements that are unalterable by the influence of externally operative effects, so there are also no habits or conditioned reflexes that do not depend on innate moments. Both types of behaviour should therefore not be counterposed to one another in any way. We can only affirm that innate mechanisms play a greater role in some animals and mechanisms of individual experience in others. This difference, however, also does not reflect the real stadial character of the evolution of the psyche in the animal world. Rather it indicates a peculiarity characteristic of different lines of animal evolution. Innate behaviour is most clearly manifested, for instance, in insects, which are known to be located on a side branch of evolution.

A difference in the type of mechanisms that implement animals' adaptation to changes in the environment thus cannot serve as the sole criterion of the evolution of their psyche. It is not only in what main way animals' behaviour is altered that is important but primarily what its content itself and inner structure are and what are the forms of reflecting reality that are naturally associated with them.

2. The Stage of the Perceptive Psyche

The next stage after that of the elementary sensory psyche, the second stage of evolution, can be called that of the perceptive psyche. It has the capacity to reflect external, objective reality already in the form of a reflection of *things* rather than in the form of separate elementary sensations evoked by separate properties or a combination of properties.

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11 See: E. Rabaud. *Art. cit.*

The transition to this stage in the evolution of the psyche is associated with a change in the structure of animals' activity already prepared for in the preceding stage. This change consists in the content of this activity already mentioned above, which is objectively related to the conditions in which the object is objectively given in the environment, rather than to the object itself toward which the animal's activity is directed, now being distinguished. This content is no longer associated with what excites the activity as a whole but responds to the special influences that evoke it.

When a mammal is separated from food by an obstacle, it will, of course, go around it. That means that, as in the behaviour of the fish described above in conditions of an obstructed tank, we can distinguish a certain content in its activity relating objectively to the barrier, which represents one of the external conditions in which the given activity takes place, rather than to the food itself toward which it is directed. Between the activity of fish described and that of mammals, however, there is a great difference, which is expressed in this, that while the content of the fish's activity (roundabout, movements) was retained after removal of the barrier and disappeared only gradually, higher animals usually make directly for the food in such a case. This means that the influence to which mammals' activity is directed no longer merges with influences from the barrier in them, but both operate separately from one another for them. The direction and end result of the activity depends on the former, while the way it is done, i.e. the mode in which it is performed (e.g. by going around the obstacle) depends on the latter. This special make-up or aspect of activity, which corresponds to the conditions in which the object exciting it is presented, we shall call *operation.*

It is this distinguishing of operations in activity that indicates that properties affecting an animal, which previously seemed to be all of a muchness to it, begin to fall into groups: on the one hand interconnected properties emerge that characterise the object to which the activity is directed, while on the other hand properties emerge of objects that determine the mode of the activity itself, i.e. the operation. Whereas differentiation of the affecting properties was linked at the stage of the elementary sensory psyche with their simple uniting around the dominant stimulus, the integrating of the affective properties into a single integral image, and their unification as the properties of one and the same thing now arise for the first time. The surrounding reality is now reflected by the animal in the form of more or less separated images of separate things.

The majority of now existing vertebrates are at various levels of the stage of the perceptive psyche. The transition to this stage was seemingly linked with the passage of vertebrates to a terrestrial mode of life.

The rise and development of a perceptive psyche in animals were governed by several essential anatomical and physiological changes. The main one was the development and change of role of distant sense organs (i.e. ones operating at a distance), primarily of vision. Their development was expressed in an alteration both of their significance in the general system of activity and in the form of their anatomical interconnections with the central nervous apparatus. Whereas differentiation of sense organs in the preceding stage of evolution had led to the singling out of dominant organs among them, among vertebrates the leading organs more and more became those that integrate external influences. That became possible because of the simultaneously occurring restructuring of the central nervous system and the formation of a forebrain, and then of a cerebral cortex (for the first time in reptiles). Originally (among fish, amphibians, and reptiles) the forebrain was a purely olfactory formation constituting a sort of continuation of their central olfactory apparatus. In subsequent evolution (among mammals) the importance of the olfactory centres in the cerebral cortex was greatly reduced through the representation of other sense organs. This is clearly seen when we compare the place occupied by the olfactory cortex, for example, in a hedgehog (Fig. 22) and a monkey (Fig. 23).

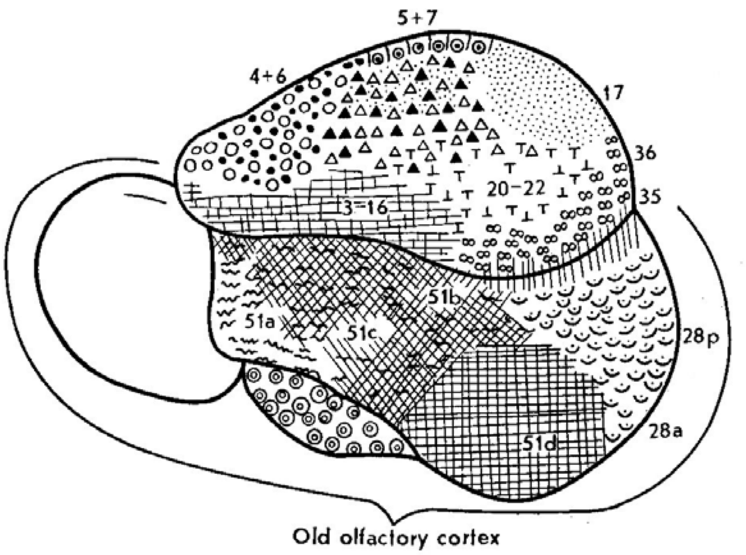

Fig. 22. Olfactory region of the cerebral cortex of a hedgehog.

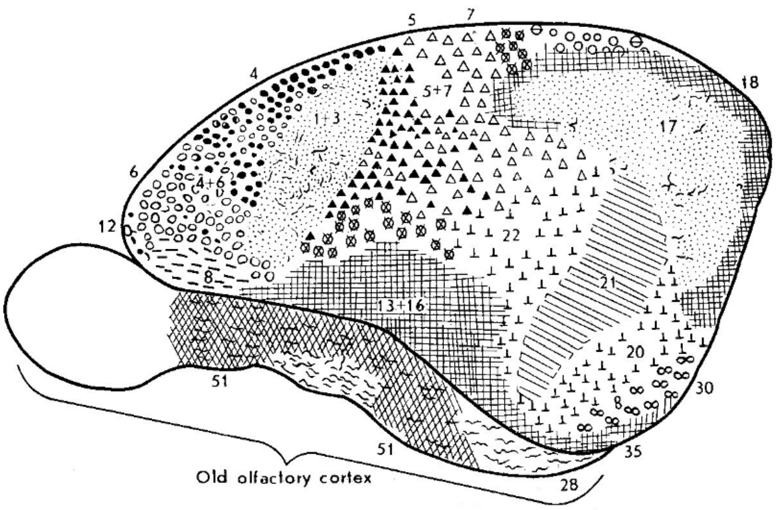

Fig. 23. Olfactory region of the cerebral cortex of a lower ape.

Vision, on the contrary, whose 'corticalisation' occurred initially with the reptiles, occupies a relatively ever greater place in the cortex (see Fig. 24). In birds the eyes become the main receptor (Fig. 25). Vision also plays the main role in many higher mammals.

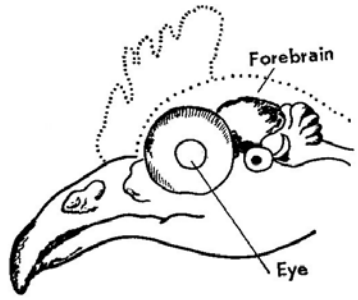

Fig. 24. The brain of a bird

The organs of external movement developed simultaneously, i.e. animals' 'natural tools' enabling them to perform the complicated operations demanded by life in a terrestrial environment (running, climbing, pursuing prey, overcoming obstacles, etc.). Animals' motor functions were also more and more corticalised (i.e. transferred to the cortex of the brain), so that full development of operations proceeded in animals in connection with the evolution of the cortex.

Thus, whereas the activity of lower vertebrates was still mainly linked with lower-lying centres (subcortical ganglia), it subsequently became more and more dependent on the cortex, changes in whose structure also reflect all its subsequent evolution.

Differentiation of the operations that characterise the stage of the perceptive psyche laid the basis for the evolution of a new form of fixing animals' experience, for fixing it in the form of motor habits in the narrow sense of the term.

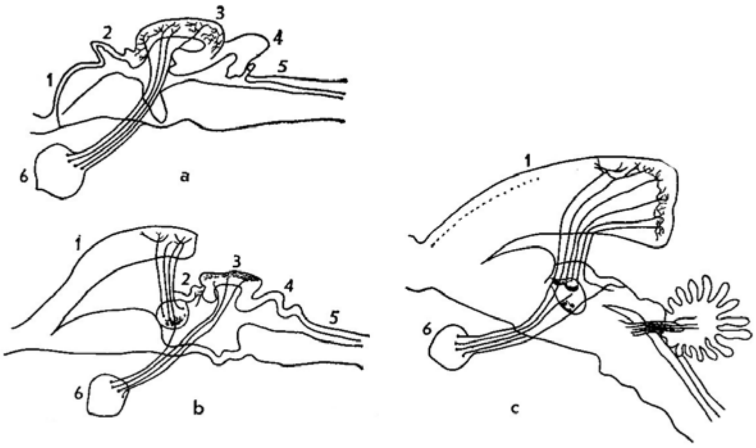

Fig. 25. Gradual shifting of the visual centres in the cerebral cortex of vertebrates (after Monakov). Visual paths and centres of the brain (a) of a frog, (b) of a reptile, (c) of a mammal; 1 – the forebrain; 2 – the between-brain (diencephalon); 3 – the midbrain; 4 – the cerebellum; 5 – the medulla oblongate; 6 – an eye.

Any connections arising in individual experience are sometimes called habit. In that wide conception, however, the concept of habit becomes very blurred, embracing a vast circle of quite different processes, beginning with changes in the reactions of infusoria and ending with man's complicated actions. In contrast to that, in no way justified broadening of the concept of habit, we shall call only fixed operations habits.

That definition of habit coincides with the understanding of habits first advanced in Soviet psychology by Protopopov, who demonstrated experimentally that motor habits are formed in animals from the motor elements of overcoming obstacles, and that the content of habits is determined by the character of the obstacle itself, while the stimulus (i e. main exciting influence) only affects a habit dynamically (the speed and firmness of its forming) and is not reflected in its content.[12]

The motor elements forming part of the habits of animals may be different in character; they may be both species, innate movements and movements acquired in previous experience; finally they may be

12 See: V. P. Protopopov. *Usloviya obrazovanlya motornykh navykov i ikh fiziologicheskaya kharakteristika* (The Conditions for the Forming of Motor Habits and Their Physiological Characteristics), Kharkov-Kiev, 1935.

movements fixed in the course of the chance motor trial and error made by the animal during the formation of the given habit.

Clearly expressed habits in the proper sense are observed at first only in animals that have a cerebral cortex. The mechanism of the formation and fixing of systems of precisely cortical conditioned nerve connections must therefore be considered the physiological base of the formation of habits.

During the transition to the stage of perceptive psyche the sensory form of the fixing of experience also changes qualitatively. Sense representations arise for the first time in animals.

The problem of the existence of representations in animals is still a matter of dispute. A vast number of facts, however, convincingly indicate that animals have representations.

Tinklepaugh's experiments underlay systematic experimental study of this problem. He showed fruit to an animal (monkey) and then, behind a board, surreptitiously replaced it by lettuce, which is much less attractive. The animal was then allowed to move behind the partition; though finding lettuce there it nevertheless continued to look for the fruit previously seen.[13]

Similar experiments made with a fox by Voitonis and Kreknina yielded the same results.[14]

The observations on a dog described by Beritov are of great interest in this respect.[15] In his experiments with conditioned reflexes, the dog was put in a certain spot and then given a conditioned signal in response to which it ran to a simultaneously uncovered feeding dish, and received food. During these experiments the following test was made: before the dog was brought into the laboratory, it was walked to the far end of the corridor and shown food lying there, without however being signalled to take it. Then it was led back to the laboratory and given the conditioned signal. When it ran to the feeding dish, however, there was no food there. It proved, in these conditions, that the dog did not return as usual to its place but ran out into the corridor to the spot where it had previously seen food.

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13 See: O. L. Tinklepaugh. An Experimental Study of Representative Factors in Monkeys. *The Journal of Comparative Psychology,* 1928, 8, 3: 197-236.

14 See: H. Yu. Voitonis, A. V. Kreknina. Data on the Comparative Psychological Study of Memory. In: *Instinkty i navyki* (Moscow, 1935).

15 See: I. S. Beritov. Reflex and Behaviour. *In: Trudy biologicheskogo sektora AN SSSR*, Gruzinskoe otdelenie, Vol. 1, 1934.

Buytendijk and Fischel's experiments with dogs were of a more specialised character. They were able to demonstrate experimentally that in contrast to lower vertebrate organisms (fish), a dog is oriented in reactions to a previously experienced situation (a lure concealed from its sight) on the actual thing that it has been shown.

Thus, together with a change in the structure of animals' activity and a corresponding change in the form of their reflection of reality there is also a restructuring of the function of memory. Earlier, at the stage of elementary sensory psyche, this function was expressed in the motor sphere of animals in the form of a change, under the impact of external influences, in movements associated with the influence affecting the animal, and in the sensory sphere in a reinforcement of the links between separate effects. Now, at this higher stage of evolution, the mnemonic function operates in the motor sphere in the form of motor habits, and in the sensory sphere in the form of a primitive, image memory.

The processes of analysing and generalising the environment affecting animals undergo even greater changes in the transition to the perceptive psyche.

Already in the first stages of the evolution of the psyche processes of animals' differentiation and uniting of separate effects can be observed. When, for example, an animal that earlier reacted identically to two different sounds, is put into a situation in which only one of these sounds will be associated with a biologically important effect, the other will gradually cease to evoke any reaction whatever in it. The sounds are differentiated from one another; the animal now reacts selectively. Conversely, when a whole number of different sounds are associated with one and the same biologically important effect, the animal will react identically to any one of them; they take on an identical biological meaning for it. There is a primitive generalising of them. Thus, within the stage of the elementary sensory psyche processes both of differentiation and of generalisation of separate influences and separate affective properties by the animal are observed. In that respect it is important to note that these processes are not governed by an abstractly selected correlation of effects but depend on their role in the animal's activity. Therefore, whether animals easily differentiate between various influences or not and generalise them or not depends not so much on their degree of objective similarity as on their concrete biological role. Bees, for instance, easily differentiate between forms similar to the forms of a flower, but have difficulty in differentiating between even clearly different abstract forms (triangles, squares, etc.).

That position holds as well in subsequent stages of the evolution of the animal kingdom. Dogs, for example, react to even slight scents of animal origin, but do not react to plant smells and perfumes, etc. (Binet and Passy[16]). In general, when a given odour acquires biological sense for a dog, it is capable of differentiating it very finely; the findings of special research indicate that a dog distinguishes in experimental conditions between odours of very dilute organic acids (one part in a million).[17]

The main change in the processes of differentiation and generalisation during the transition to a perceptive psyche is expressed in the rise in animals of differentiation and generalisation of the images of things.

The origin and evolution of a generalised reflection of things is already a much more complex problem, on which we must dwell specially.

The image of a thing is not a simple sum of individual sensations or the mechanical product of many simultaneously operating properties belonging to objectively different things. If, for instance, we have two things of whatever sort A and B that possess properties a, b, c, d and m, n, o, p, then, for an image to arise, these separate affective properties must function as part of two separate entitles (A and B), i.e. they must be differentiated in precisely that respect. This means, also, that when the given influences are repeated among others, their previously differentiated unity must be perceptible as the thing itself. Given the inevitable variability of the environment, however, and of the conditions of perception itself this is only possible when the image of the thing arising is generalised.

In the cases described we see dual interconnected processes: those of the transfer of operations from one concrete situation to another, objectively similar to it, and those of the forming of a generalised image of a thing. The generalised image of the thing, in arising together with the shaping of an operation in relation to, and on the basis of, this thing, enables the operation to be transferred subsequently to a new situation; in this process the previous operation comes into a certain disharmony with the object conditions of activity through the changes in these conditions and therefore of necessity is altered and reorganised. The generalised image of the thing is correspondingly reorganised, made more precise, and absorbs the new

16 Cited from H. Henning. Geruchsversuche am Hund. *Zeitschrift für Biologie*, 1921, 70 (neue Folge 52) :1.

17 H. Henning. *Op. cit.*

content as it were, which in turn leads to the possibility of a further transfer of the operation to new object conditions calling for their ever fuller and more correctly generalised reflection by the animal.

Perception is thus still fully included here in the animal's external motor operations. Generalisation and differentiation, synthesis and analysis take place in a single process.

The evolution of operations and generalised perception of the surrounding external reality finds its reflection in a further complicating of the cerebral cortex. There is further differentiation of the integrative fields, which occupy an ever bigger place in the cortex (see Fig. 26).

The function of these higher integrative fields is, as their name implies, precisely to integrate separate influences.

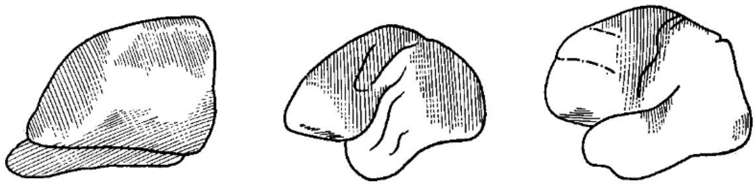

Fig 26. The cerebral cortex of a rabbit, lower ape and man. Hatched zones – projection fields; unhatched zones – integrative field. There is a marked relative increase in the unhatched areas (integrative fields) as we pass to higher stages of development (after von Economo).

(Note: drawings are not to scale.)

3. The Stage of Intellect

The psyche of most mammals remains at the stage of the perceptive psyche, but the most highly organised mammals have risen to an even higher stage of evolution.

This new, higher stage is normally called the stage of intellect (or 'manual thinking').

The intellect of animals, of course, is not quite the same as human reason; as we shall see, there is an immense qualitative difference between them.

The stage of intellect is characterised by very complex activity and just as complex forms of reflecting reality. Therefore, before we deal with the conditions for the passage to this stage, we must describe the activity of animals that are at this stage of evolution in its external expression.

The intellectual behaviour of the most highly developed animals – the anthropoid apes – was first systematically studied in the experiments carried out by Köhler.

These experiments followed this pattern.

The apes (chimpanzees) were housed in a cage. Outside the cage, just far enough away that the ape's arm could not reach it, bait was placed (bananas, oranges, etc.). Inside the cage there was a stick. The ape, attracted by the bait, could only bring it closer to itself in one way, by using the stick. How did the ape behave in this situation? As it happened, it first began to try and snatch the bait directly with its hand. The attempts were unsuccessful. The ape's activity seemed to fade for a time. It turned away from the bait and stopped its attempts. Then activity was resumed, but now took another path. Without trying to grab the fruit directly by its hand, the ape picked up the stick, thrust it toward the fruit, touched it, drew the stick back, again thrust it out and again drew it back, with the result that the fruit was drawn closer and the ape snatched it up. The problem was solved.

The many other problems set anthropoid apes have been built on the same principle; their solution also required the adoption of a mode of activity such as could not be formed during solution of the problem set. For example, bananas were hung from the upper lattice of the enclosure where the apes were kept, out of their direct reach. Nearby was an empty box. The only possible way of reaching the bananas in this case was to drag the box over to the spot above which the bananas hung, and to use it as a stand. Observations showed that apes solved this problem without noticeable preliminary learning.

Thus, while operations are formed slowly at a lower stage of evolution, by way of many trials during which successful movements are gradually fixed, and other, unnecessary movements are gradually inhibited, and fade out, in the case of apes we observe first a period of complete failure – many attempts not leading to accomplishment of the activity, and then suddenly, as it were, the finding of an operation that almost immediately leads to success. That is the first characteristic feature of the intellectual activity of animals.

A second characteristic feature is that when an experiment is repeated once more, the operation concerned is reproduced, in spite of its having been performed only once, i.e. the ape solves a similar problem already without any preliminary trials.

A third feature of this activity is that the solution found for a problem is very easily transferred by the ape to other conditions only similar to those in which the given solution was first found. If an ape, for example, has solved the problem of bringing fruit closer to it by means of a stick, it proves that, if it is now deprived of the stick, it easily employs some other suitable object in place of it. If the position of the fruit is altered in relation to the cage, or if the situation is altered slightly in general, the animal all the same finds the necessary solution. The solution, i.e. the operation, is transferred to another situation and adapted to this new situation, rather different to the first one.

We must note one group of facts among the many obtained in experimental research with anthropoid apes, which has a certain qualitative peculiarity. These facts show that anthropoid apes are capable of uniting two different operations into a single activity.

For example, bait is placed outside the cage in which the animal is housed, at a certain distance from it. Rather nearer to the cage but also beyond the animal's reach is a long stick. Another shorter stick that can reach the long one but not the bait is put into the cage. To solve this problem the ape must first pick up the short stick, draw the long stick to itself, and then pull the bait to it with the long stick (see Fig. 27).

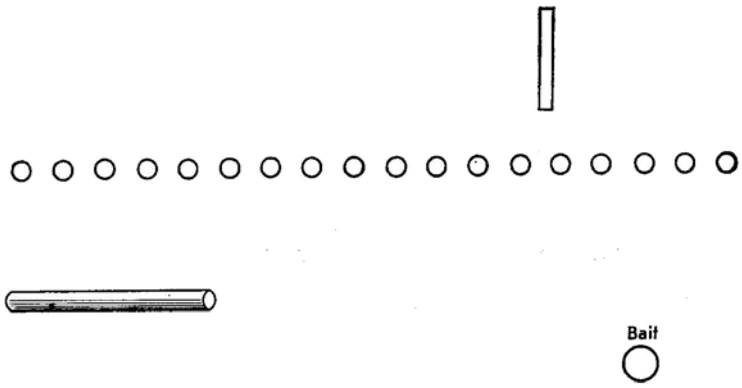

Fig. 27. Scheme of a two-phase problem.

Apes usually cope with such 'two-phase' tasks without special difficulty. So a fourth feature of intellectual activity consists in a capacity to solve two-phase tasks.

Subsequent experiments by other researchers have shown that these characteristic features are preserved as well in the more complicated behaviour of anthropoid apes (Ladygina-Kots and Vatsuro).[18]

18 See: N. N. Ladygina-Kots. *Issledovanie poznavatel'nykh sposobnostei shimpanze* (Research into the Cognitive Faculties of Chimpanzees), Moscow, 1928.

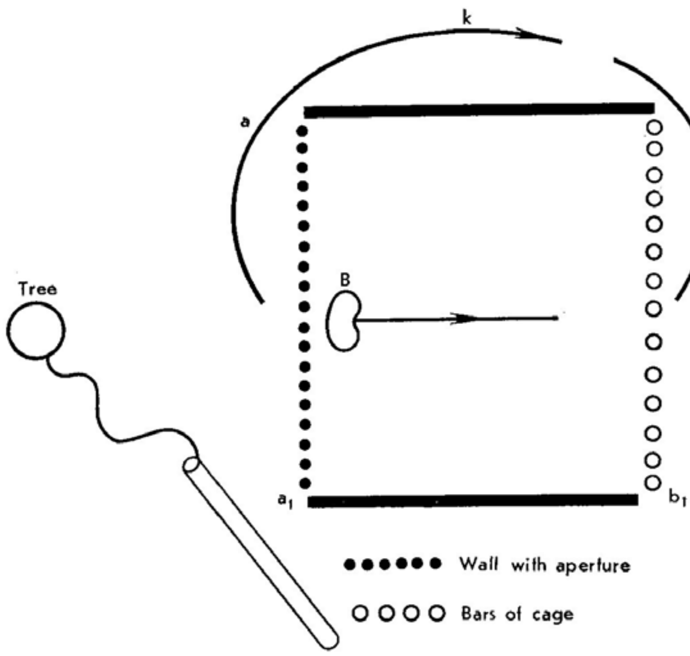

Fig. 28. Scheme of a complex problem.

An example of the solution of a very complicated task by an anthropoid ape is the following experiment (Fig. 28). In the enclosure where the apes lived a box was set one side of which was a cage while the other side had a narrow, longitudinal slit. Fruit was put near the back of this box, clearly visible both through the bars at the front, and through the slit behind. The bait was too far away from the bars for the ape to reach it. It was also impossible to reach the bait from the rear wall itself because the slit was too narrow to admit the ape's arm. A strong stake was driven into the ground near the rear wall, and a stick fastened to it by a not very long chain.

The solution of this problem consisted in pushing the stick through the slit in the rear wall and shoving the fruit forward to the front bars, through which it could then be pulled out simply by the hand.

How did the ape behave in this situation? On coming up to the cage and noticing the fruit, it first tried to reach it through the bars. Then it went round the box and looked at the fruit through the slit at the back. It tried to pull the fruit through the slit by means of the stick, but that was impossible. Finally, the animal pushed the fruit away with the stick, and went round the box so as to pull it out through the bars.

How were all these complicated operations, observed in the experiments described, formed? Did they really originate suddenly without any preliminary preparation, as it seemed from the first outward impression? Or were they built up in the main in the same way as in the preceding stage of evolution, i.e. through gradual, albeit much faster, selection and fixing of movements leading to success?

The answer to that is clear from an experiment described by French workers, which was carried out as follows. An anthropoid ape was housed in a cage. A small box was fixed on the outside of the bars with an opening on the side opposite the bars. An orange was put close to the wall of the box. To get it in this situation the animal had to knock it out of the box by a blow. Since such a blow could be made accidentally, the researchers adopted the following clever device in order to avoid such a possibility. They fastened a fine-meshed net above the box, with a mesh being so fine that the ape could only poke a finger through it; the height of the box was so calculated that the ape, while able to touch the orange, could not hit it with force. Each touch could therefore only move the fruit a few centimetres forward. Chance was thus excluded from the solution. On the other hand this gave a possibility of studying exactly how the fruit was knocked out. Would the ape move the orange anyhow, so that its path would be built up from separate displacements that would accidentally take it to the edge of the box? Or would it guide the fruit by the shortest path to the exit from the box, i.e. would its action be built up of movements directed in a definite way rather than from chance ones? The animal itself gave the best answer to the question posed. Because the business of gradually shifting the orange took much time, and apparently tired the animal, it already, half-way through impatiently made a searching movement of the arm, i.e. tried to grab the fruit; having discovered that it was impossible to do so, it again began slowly pushing it until the orange was within range of its hand.[19]

Köhler considered that the main attribute distinguishing the behaviour of these animals from that of other members of the animal kingdom, and which brought it closest to the behaviour of man, was precisely that their operations were not shaped gradually through trial and error but arose suddenly, independently of previous experience, by insight as it were.[20] A second attribute of intellectual behaviour,

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19 See: P. Guillaume, I. Meyerson. Recherches sur l'usage de l'instrument chez les singes. *Journal de psychologie normale et pathologique*, 1930, 3/4: 177-236.

20 See: W. Köhler. The Mentality of Apes (Routlege & Kegan Paul, London, 1925; Penguin Books, London, 1957), pp 219, 265.

derived from the first, he considered to be a capacity to remember the found solution 'once and for all', and to transfer it broadly to other conditions similar to the original ones. As regards the fact of apes' solving two-phase problems, Köhler and others following him consider that a combination of two moments underlies it: the animal's 'insight' and the transfer of a solution earlier found. They thus did not consider this fact to have any fundamental significance.

From that point of view, it is sufficient to explain the main fact, i.e. the fact of an animal's sudden finding of a way to solve the first, initial problem, in order to understand the whole peculiarity of apes' intellectual activity.

Köhler tried to explain this by anthropoid apes' having a faculty of correlating separate things, distinguishable from one another, in perception, so that they were perceived as part of a single 'integral situation' (Gestalt).

This property of perception itself, its structured character, is only a partial case, in Köhler's view, expressing the general 'Gestalt principle' that allegedly underlies not only the psyche of animals and man and their vital activity, but also the whole physical world.

From this point of view the 'Gestalt principle' can serve as an explanatory principle, but itself is then inexplicable and does not require explanation. The attempt to bring out the essence of intellect starting from this idealist 'Gestalt theory' is, it goes without saying, unsound. Quite clearly it is not sufficient to enlist the structured character of perception to explain the peculiarity of higher animals' behaviour. For, from the standpoint of the adherents of the 'Gestalt principle', structured perception is not only peculiar to the higher apes but is also peculiar to much less developed animals; intelligent behaviour, however, is not observed in the latter.

This explanation is also unsatisfactory from another aspect. By stressing the suddenness of the intellectual solution and isolating that fact from the content of an animal's experience, Köhler left a whole number of circumstances out of account that characterise the behaviour of apes in their natural environment.

Bühler, it seems, was the first to draw attention to the fact that there is something in common between an ape's drawing a fruit to itself by means of a stick, and pulling a fruit growing on a tree to itself by means of a branch. Attention was then drawn to the fact that the roundabout path observed in apes could also be explained by the fact that these animals, living in forests and passing from one tree to another, must constantly 'orient themselves' to the route in advance, or else they would find themselves in an impasse of the natural labyrinth formed by the trees. It is not accidental, therefore, that apes display a developed faculty for solving problems in a 'roundabout way'.[21]

The idea that the explanation of apes' intellectual behaviour must be sought above all in its link with their normal species behaviour in their natural environment has been expressed more and more definitely of late in the works of psychologists and physiologists.

From that point of view an intellectual 'solution' is nothing more than the application in new conditions of a mode of activity phylogenetically developed. This transfer of a mode of action differs from the ordinary transfer of operations in other animals only in happening within wider limits.

Thus, according to this conception of the intellectual behaviour of apes, its main attributes distinguished by Köhler must be correlated with one another in the opposite order. Its special character (suddenness) must not be explained by the transfer of a found solution, but on the contrary the sudden solution of an experimental problem must itself be understood as the result of the animal's capacity for a broad transfer of operations.

That conception of apes' intellectual behaviour agrees well with certain facts, and has the virtue that it does not counterpose the animal's intellect to either its individual or species experience, and does not separate intellect from habit. But it also comes up against serious difficulties. First of all it is clear that neither the moulding of operations nor their transfer to new conditions of activity can serve as distinguishing attributes of the behaviour of higher apes, because both these moments are also common to animals at a lower stage of evolution. We observe both these moments, though in less clear form, in many other animals as well, viz., among mammals and birds. The difference in activity and psyche between the latter and apes, it turns out, is a purely quantitative one: a slower or quicker moulding of the operation, and narrower or broader transfers. But the behaviour of apes differs qualitatively as well from that of lower mammals. Their use of instruments and the special character of their operations are quite clear evidence of that.

Furthermore, the conception of animals' intellect cited above leaves the main thing undisclosed, namely what is the wide transfer of actions observed in apes and what is the explanation of it.

21 See: Karl Bühler. Die geistige Entwicklung des Kindes (Fischer, Jena, 1930), p 22.

To answer these questions we must again change the places of the features of animals' intellectual behaviour pointed out by Köhler, and make a third characteristic fact that in his opinion is of no fundamental importance the starting point of the analysis, namely apes' capacity to solve two-phase problems.

In two-phase problems the two-phased nature of any animal intellectual activity comes out particularly clearly. It is necessary first to pick up the stick and then to get the fruit. It is necessary first to push the fruit away, and then to go round the cage and reach for it from the opposite side. Touching the stick by itself leads to taking hold of it but not to seizure of the fruit that attracts the animal. It is the first phase. Unconnected with the next phase it lacks any biological sense whatsoever. It is a phase of preparation. The second phase – use of the stick – is already the phase of the realisation of activity toward a goal, directed to satisfying a given biological need of the animal. Thus, if we approach the apes' solution of any of the problems given them by Köhler from this point of view it proves that each of them required two-phase activity: to pick up a stick—to pull the fruit to itself, to move away from the bait—to possess the bait, to turn the box over—to reach the fruit, and so on.

What is the essence of these two phases of the apes' activity? The first, preparatory phase is apparently not stimulated by the object to which it is directed, for example not by the stick itself. If the ape sees a stick in a situation that does not require its use, except, for example, a roundabout way, it will not, of course, try to take hold of it, which means that the ape does not associate this phase of the activity with the stick but with the stick's objective relation to the fruit. The reaction to this relationship is nothing other than preparation for the next, second phase of the activity, i.e. the phase of realisation.

What is this second phase? It is already directed to the object that immediately stimulates the animal, and is built up according to definite objective conditions, and consequently includes some operation or other that becomes a quite firm habit.

When we pass to the third, highest stage of animal evolution we thus observe a new complication in the structure of activity. The activity previously merged in a single process is now differentiated into two phases, one of preparation and one of accomplishment. The existence of a preparatory phase also constitutes a characteristic feature of intellectual behaviour. Intellect arises for the first time, consequently, when preparation of the possibility to perform some operation or habit commences.

An essential attribute of two-phase activity is that new conditions no longer evoke simply trial movements in the animal but trials of previously developed ways or operations. How, for example, does a hen behave when driven out of an enclosure? It rushes blindly from side to side, trying to find a way out, i.e. simply increases its motor activity, until finally a chance movement leads to success. Higher animals behave differently in face of a difficulty. They also make trials, but these are not trials of separate movements but are primarily trials of various operations or modes of activity. Thus an ape, faced with a locked box, first tries the habitual operation of pressing on the lever; when that does not work, it tries to gnaw a corner of the box; then it employs a new method, to get into the box through the slit in the door. Then follows an attempt to gnaw off the lever, which is succeeded by an attempt to pull it off by its hand; finally, when that does not work, it employs the next method, to try and turn the box over.[22]

This feature of apes' behaviour, which consists in their being able to solve one and the same problem in many ways, is most important evidence of their operations, like those of other animals at the same stage of evolution, having ceased to be connected in fixed way with the activity appropriate to a problem, and not requiring the new problem, for their transfer, to be directly similar to an earlier one.

Let us now consider intellectual activity from the aspect of animals' reflection of their environment.

In its outward expression the first, main phase of intellectual activity is directed to preparing for its second phase, i.e. is objectively governed by the next activity of the animal itself. Does that mean, however, that the animal has its next operation in mind, i.e. that it is capable of imagining it? There is nothing to justify such a supposition. The first phase corresponds to the objective relation between things. This relation of the things must also be reflected by the animal, which means that in the transition to intellectual activity the form of animals' psychic reflection is altered in fact simply in a reflection of the relations of things (situations) arising as well as a reflection of things.

The character of the transfer also changes – accordingly, and consequently also the character of the animals' generalisations. The transfer of an operation is now a transfer not only on the principle of the similarity of things (e.g. obstacles), with which the given operation was associated, but also on the principle of the similarity of relations,

22 See: J. V. Buytendijk. *Op. cit.*

of the connections between things, to which it responds (e.g. branch-fruit). An animal now generalises the relations and connections of things. Its generalisations are formed, of course, exactly like the generalised reflection of things, i.e. during the activity itself.

The origin and evolution of animals' intellect has its anatomical and physiological basis in a further development of the cerebral cortex and its functions. What are the main changes in the cortex observable in the higher stages of the evolution of the animal kingdom? The new thing that distinguishes the brain of higher mammals from that of lower animals is the relatively much greater place occupied by the frontal lobe, which is developed through differentiation of its prefrontal fields.

Study of the intellect of higher apes indicates that man's thinking has its real preparation in the animal kingdom, and that in this respect, too, there is no insuperable gulf between man and his animal ancestors. While noting the natural continuity in the evolution of the psyche in animals and man, however, one must not exaggerate their similarity in any way, as certain contemporary zoopsychologists do who try in their experiments with apes to demonstrate the alleged antiquity and naturalness of such 'intellectual behaviour' as working for pay and money exchange.[23]

Attempts to counterpose the intellectual behaviour of apes sharply to the behaviour of their higher mammals are also wrong. We now have many facts at our disposal that indicate that two-phase activity can be discovered in many higher animals including dogs, raccoons, and even cats (in the last named, which belong to the 'lurking' animals, it is true only in a very special expression).

Intellectual behaviour, which is proper to higher mammals, and which attains especially high development in apes, is thus the upper limit of the evolution of the psyche, after which the history of the evolution of a psyche of a quite different, new type begins, peculiar only to man, i.e. the history of the evolution of human consciousness.

4. The General Features of the Psyche of Animals

The prehistory of human consciousness is, as we have seen, the long, complex process of the evolution of animals' psyche.

When we observe the whole road that its development has taken, its main stages and the main patterns governing it stand out distinctly.

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23 See: J. B. Wolfe. Effectiveness of Token-Rewards for Chimpanzees. *Comparative Psychological Monographs*, 1936, 12: 1-72.

The psyche of animals develops during their biological evolution and is governed by the general laws of that process. Each new stage in psychological evolution has as its basis a transition to new external conditions of animals' existence and a new step in the complication of their physical organisation.

Adaptation to a more complex, physically shaped environment leads to differentiation of the primitive nervous system in animals and of special organs of sensitivity. An elementary sensory psyche also arises on that basis, i.e. a capacity to reflect the separate properties of the environment.

Subsequently, with the transition of animals to a land mode of existence, and the development of the cerebral cortex caused by that step, psychic reflection of the wholeness of things by animals arises, and a perceptive psyche originates.

Finally, further complication of the conditions of existence, which leads to the evolution of ever move perfected organs of perception and action and an ever more perfected brain, creates the possibility in animals of their sense perception of the objective relations of things in the form of object 'situations'.

We thus see that the evolution of the psyche is governed by animals' need to adapt to the environment, and that psychic reflection is a function of the appropriate organs formed during that adaptation. We must specially stress here that psychic reflection is by no means solely a 'purely subjective', secondary phenomenon of no real significance in animals' life and in their struggle for existence; on the contrary, as we have already said, the psyche arises and evolves in animals precisely because they could not orient themselves otherwise in their environment.

The evolution of life thus leads to a change in animals' physical organisation, to the emergence in them of organs like sense organs, motor organs, and a nervous system, whose function is to reflect the reality around them. What does the character of this function depend on? What governs it? Why is it expressed in some conditions, for example, in the reflection of separate properties and in other in a reflection of the wholeness of things?

We have found that this depends on the objective structure of animals' activity in practice connecting the animal with the world around it. In responding to a change in the conditions of existence, animals' activity alters its structure, its 'anatomy' so to speak. That also creates a need for such a change in the organs and their functions which leads to the emergence of a higher form of psychic reflection. We can express this in brief as follows: whatever the objective structure of an animal's activity, such will also be the form of its reflection of reality.

The evolution of animals' reflection of their environment, however, also, as it were, lags behind the evolution of their activity. The simplest activity governed by the objective links of the affective properties and correlating the animal with a complex environment formed of things thus conditions the development of elementary sensations, which reflect only separate influences. The more complicated activity of vertebrates, determined by the physical relationships of things and situations, is linked with the reflection of whole things. Finally, when a 'phase of preparation' objectively determined by the possibilities of the animal's further action is differentiated at the stage of intellect, the form of the psyche is characterised by reflection of the physical relations of things and their physical situations.

The development of the form of psychic reflection is thus, as it were, a step downward shifted in relation to the evolution of the structure of animals' activity, so that there is never a direct correspondence between them.

Or rather, this correspondence can only exist as a moment marking a transition in evolution to the next, higher stage. Elimination of said disparity through the emergence of a new form of reflection opens up new possibilities of activity, which acquires an ever higher structure, with the result that a disparity and contradiction again arises between them, but now already at a higher level.

The material basis of the complex process of the evolution of animals' psyche is thus the formation of their 'natural implements' of activity, i.e. their organs and the functions inherent in these organs. The evolution of organs and the functions of the brain corresponding to them, which takes place at each stage of the evolution of animals' activity and psyche gradually prepares the possibility of a transition to a new, higher structure of their activity as a whole; the change in the general structure of animals' activity emerging with this in turn creates a need for further evolution of individual organs and functions, which now already seems to take a new direction. This change as it were in the very direction of the evolution of separate functions in the transition to a new structure of activity and to a new form of reflection of reality shows up very distinctly.

At the stage of the elementary sensory psyche, for instance, a memory function takes shape on the one hand in the direction of fixing the links of separate affective properties, and on the other hand as a function fixing the simplest motor connections. This function of the brain evolves at the stage of the perceptive psyche in the form of a memory of things and on the other hand in the form of the evolution of a capacity to form motor habits. Finally, at the stage of intellect its evolution takes yet another new direction, toward the development of a memory of complex relationships and situations. Similar qualitative changes are observed also in the evolution of other individual functions.

In reviewing the evolution of the animal psyche we first of all stressed the differences that exist between its forms. Now we have to distinguish what these different forms have in common and what makes the activity of animals and their psyche qualitatively different from human activity and human consciousness.

The first difference between any animal activity and human activity is that the former is instinctive, biological activity.[24] In other words, animal activity can only be realised in relation to an object of vital, biological need or in relation to affective properties and things and their relationships (situations), that acquire the sense for animals of something that is connected with satisfying a certain biological need. Any change in animal activity therefore expresses in itself a change in the actual influence stimulating this activity, and not in the vital relationship itself that is realised by it. In ordinary experiments in forming a conditioned reflex in animals, for example, no new relation arises of course; no new need develops in it, and if the animal now responds to the conditioned signal that is only because this signal now acts on it in the same way as an unconditioned stimulus. If we analyse any of an animal's diverse activities in general, we can always establish a certain biological relation that it realises, and consequently find the biological need underlying it.

Animals' activity thus always remains within the limits of their instinctive, biological relations with nature. That is a general law of animal activity.

In that connection the possibility of animals' psychic reflection of the reality around them is also limited in principle. Because an animal enters into an interaction with a variety of objects of the environment affecting it, transferring its biological relations to them, it reflects only those aspects and properties of them that are connected with realising these relations.

Thus, whereas the figure of a triangle appears in man's consciousness irrespective of the actual relation to it, and is primarily characterised objectively, i.e. by the number of angles, etc., for an

24 From here on we shall use the term 'instinctive' in its broadest sense as directly natural.

animal capable of distinguishing shape this figure is only distinguishable in so far as it has biological sense. A shape that is distinguished by an animal among several others will not be reflected by it apart from its appropriate biological relation. When an animal therefore has no instinctive relation with a given thing or a given affective property, and the thing has no connection with realisation of this relation, the thing itself does not in that case exist, as it were, for the animal. In its activity it displays indifference to the influences concerned, which, although they could *be* an object of its perception, will *never,* however, *become* such in these conditions.

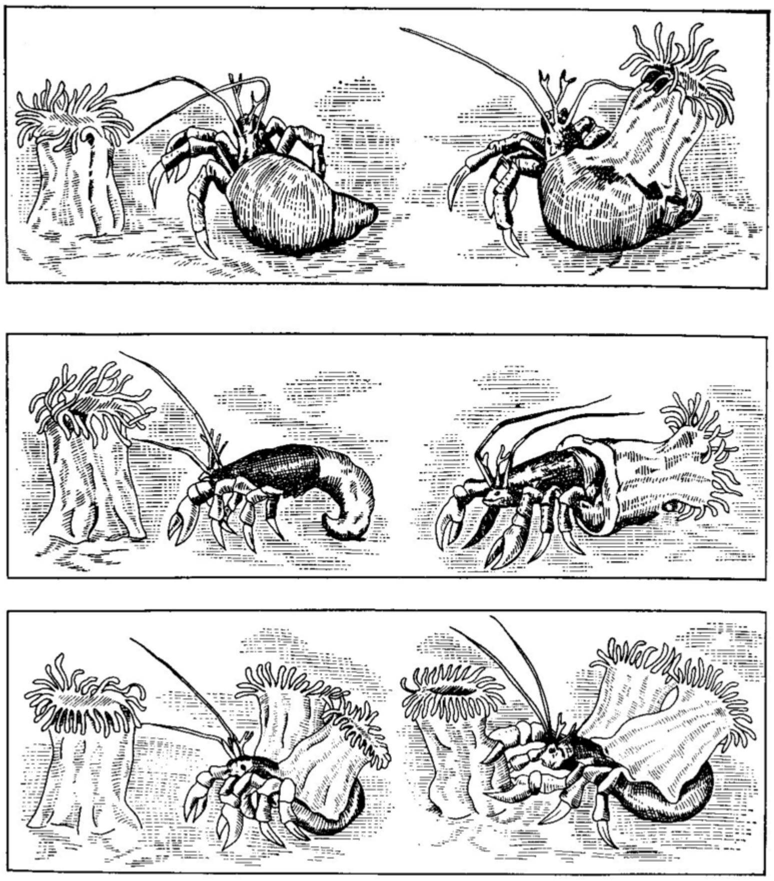

Fig. 29. Hermit crab and sea-anenome (*Actinia*)
(after Uexküll and Kriszat)

That explains the limited character of the world perceived by animals within the narrow confines of their instinctive relations. In contrast to man there is thus no stable objective object-reflection of reality in animals.

Let us explain this by an example (see Fig. 29). When a hermit crab that usually carries a sea-anemone on its shell is looking for a sea-anemone and finds one, it hoists it onto its shell (the top pair of drawings). When it moults the shell it picks up sea-anemone as a possible defence for its abdomen, which now lacks protection, and tries to back into it (middle drawings). Finally, when the crab is hungry, the biological sense of a sea-anemone for it again changes, and it begins to eat same (lower drawings).[25]

On the other hand, when an object of the environment always appears to an animal inseparable from its instinctive need, its relation to the object understandably never exists for it as such, as something separate from the object. That, too, is the opposite of what characterises human consciousness. When man enters into any relation with a thing, he distinguishes between the objective subject-matter of the relation on the one hand and, on the other hand, his relation to it *per se.* And that division does not exist in animals. 'The animal,' Marx and Engels said, 'does not "*relate*" itself to anything, it does not "relate" itself at all.'[26]

Finally, we must note yet another essential feature of the psyche of animals that distinguishes it qualitatively from human consciousness. This is the fact that animals' relations to each other are the same in principle as their relations to other external objects, i.e. also belong exclusively to the realm of their instinctive, biological relations. That is connected with the fact that animals have no society. We can observe the activity of a few, sometimes of many, animals together, but we never observe joint activity among them, i.e. joint in the sense of the word as we employ it when speaking of men's activity. For example, special observations of ants that are dragging a relatively big object along together – a twig of some sort or a big insect – indicate that the common, final path that their burden follows is not the result of these animals' joint, organised actions but is the result of the mechanical addition of the efforts of individual ants, each one acting as if it were carrying the object independently. The same is clearly visible in the most highly organised animals, i.e. in apes. When several apes are faced with a problem requiring one box to be placed on another so that they can climb up on them and so reach a banana hanging

25 See: Jacob von Uexküll, Georg Kriszat. *Streifzüge durch die Umwelten von Tieren und Menschen* (Rowohlt, Hamburg, 1958), pp 66-67.

26 Marx and Engels. "German Ideology." *MECW* vol. 5 p 44.

high above them, each of the animals acts (as observations have shown) without considering the others. With such 'joint' action, therefore, a struggle for a box often develops, and a clash and fight between the animals, so that the 'structure' remains unbuilt, despite each ape separately knowing how, though not very dexterously, to pile one box on the other and clamber up them.

In spite of these facts some writers consider that there is allegedly a division of labour among animals. For that they usually point to well-known examples from the life of bees, ants, and other 'social' animals. In fact, however, there is no real division of labour in all these cases, of course, as labour itself does not exist among them, i.e. a process that is by its very nature social.

Although separate individuals among some animals do perform different functions in association, directly biological factors underlie this difference of function. This is indicated both by the strictly defined, fixed character of the functions themselves (e.g. 'worker' bees build honeycomb, and later the queen bee lays eggs in them) and by the just as fixed character of their sequence (e.g. the consecutive change of functions of 'worker' bees). The division of functions in associations of higher animals, e.g. in a troop of apes, is of a more complex character but it is determined in that case also by directly biological causes and not at all by the objective conditions that have taken shape in the development of the activity itself of the given animal association.

The features of animals' relations with one another also determine the features of their 'speech'. As we know animals' communication is often expressed by one animal's affecting others by means of vocal sounds. That justifies our speaking of animals' speech. It applies, for example, to the signals given by sentry birds to the other members of the flock.

In this case, however, do we have a process similar to the oral communication of man? There is undoubtedly a certain similarity between them. But inwardly the processes are basically different. Man expresses a certain objective content in his speech and does not respond to speech addressed to him simply as sound stably associated with a definite phenomenon, but rather to the reality reflected in the speech. We have quite another case in the vocal communication of animals. It can readily be demonstrated that an animal reacting to the voice of another animal, responds not to what the vocal signal objectively reflects but to the signal itself, which has acquired a certain biological sense for it.

If, for instance, we pick a chick up and restrain it by force it begins to struggle and cheep; its cheep attracts the hen to it, which rushes in the direction of the sound and responds to it by a special kind of clucking. This vocal behaviour of a chick and hen is outwardly similar to oral communication. But the process is in fact of quite a different nature. The chick's cry is an innate, instinctive (unconditioned reflex) reaction, belonging to what are called expressive movements that do not indicate and do not signify any definite object, action, or phenomenon; they are only associated with a certain state of the animal evoked by external or internal stimuli. The hen's behaviour, in turn, is also a simple, instinctive response to the chick's cry, which acts on it just as such, viz., as a stimulus that evokes a definite instinctive reaction, and not as something meaningful, i.e. reflecting some phenomenon of objective reality. That can easily be confirmed by the following experiment: if we put the restrained chick, which continues to cheep, under a thick glass cover that deadens the sounds, the hen, which can distinctly see the chick but no longer hears its cheeping, ceases to display any activity whatsoever in regard to it; the sight of the struggling chick in itself leaves it indifferent. The hen thus reacts not to what the chick's cheeping objectively means, in this case to a danger threatening it, but to the sound of the cheeping (see Fig. 30).

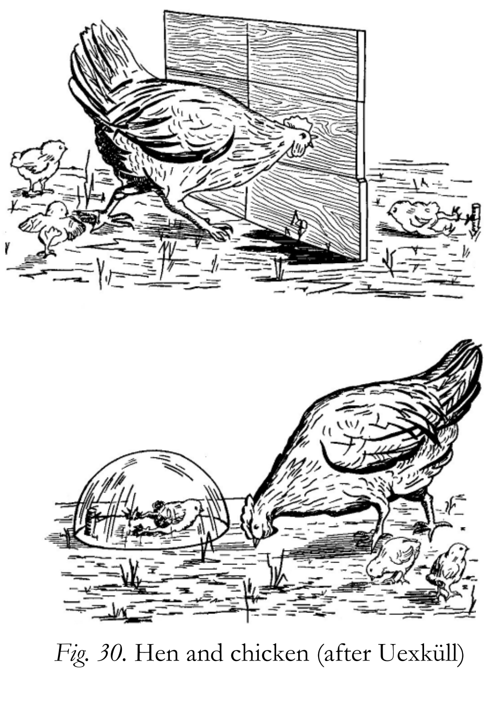

Fig. 30. Hen and chicken (after Uexküll)

In principle the vocal behaviour of even more highly developed animals remains the same in character, for example that of apes. As the findings of Yerkes and Learned indicate, it is impossible to teach apes real speech.[27]

It does not follow from the fact that animals' vocal behaviour is instinctive that it is not associated with their psychic reflection of external objective reality, but as we have already said, the objects of their environment are inseparable for animals from their relation itself to these objects. An animal's expressive activity is therefore also never related to the objective thing itself. That is clearly seen from the fact that it repeats the very same vocal reaction when the biological sense of the given influences is identical for it, although the objective affective things may be completely different, rather than when the objects are identical in character. Birds that live in flocks, for example, have specific calls that warn the flock of danger. These cries are reproduced by the bird whenever it is frightened by something. At the same time it is quite irrelevant what precisely is affecting it in the case in point: one and the same call signals the appearance of a man, the appearance of a predator, or simply some sort of unusual noise. These calls are consequently linked with some phenomenon or other of reality, not by their objectively similar attributes, but simply by the similarity of the animal's instinctive relation to them. They are not related to the objects of the environment themselves but are associated with the animal's subjective states that arise in connection with these objects. In other words the animal cries mentioned lack a stable, objective, thing significance.

The intercourse of animals is thus also completely confined to their instinctive activity both as regards its content and as regards the character of the way its concrete processes are performed.

Man's psyche, human consciousness, is a quite different form of psyche, characterised by completely other features.

The transition to human consciousness, which is underlain by a transition to human forms of life, and to human labour activity, social by its very nature, is not simply associated with a change in the fundamental structure of activity and the rise of a new form of reflecting reality; man's psyche is not only emancipated from those features that are common to all the stages of animals' psychic evolution that we have considered, and has not only acquired qualitatively new features, but (and this is the main point) the laws themselves that govern its

27 See: B. M. Yerkes, B. M. Learned. *Chimpanzee Intelligence and Its Expression* (Williams & Wilkins, Baltimore, 1925).

evolution were altered with the transition to man. While the general laws governing the laws of the psyche's evolution were those of biological evolution throughout the animal kingdom, with the transition to man the evolution of the psyche began to be governed by laws of *socio-historical development*.