ANIMAL RESEARCH AND PSI

A PANEL DISCUSSION

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PRIBRAM: I am never sure whether animals communicate exclusively by ESP, or do not have any ESP at all. I just have no way of tackling this, and I would like to hear from the others around the table what they think.

My way of approaching the problem would be to start with processes which might have relevance, such as perception, rather than trying to see whether two animal brains could communicate with each other without any intervening sensory events, simply because I do not think our technology is up to that. If one showed me a nice curve, how would I know that that curve is *the same* as some other curve from another animal at the same time? First of all, we have to time-lock events. Computer technology, which is only five years old in its sophisticated form, barely allows us now to deal with perceptual phenomena. To show that the brain waves of two organisms are in correspondence would be a very, very tricky thing to do today, the state of the art being what it is. Dr. Lindsley, do you want to lead off?

LINDSLEY: As in the case of humans, there are probably many accounts of how two animals at a distance manifested very similar behavior at the same time and in the same way, suggesting that such a concurrence might be due to some kind of transmitted influence or mysterious communication. For example, two dogs 20 miles apart in the same valley might on a given night begin baying at the same time and in a particular pattern. How does this come about? Following a general principle of science one ought to seek the simplest naturalistic solutions first. Let us assume that both dogs live at an equal distance from an equally high mountain range and that, as the moon rises, its rays appear over the mountain edge and become visible to both dogs simultaneously though they live 20 miles apart. Let us assume further that both are hound dogs and that their baying pattern is part of an inborn characteristic, as well might be their tendency to bay at the appearance of the moon. In this instance then a naturalistic event, the appearance of the moon, and its simultaneity as a stimulus to both dogs might have led to the concurrence of behavior at a distance. However, the conditions might have been far different from those assumed. How then would we account for the similarity of behavior in two dogs at a distance?

Despite the sensitivity of dogs to a higher pitch range than humans, and their possible lower threshold of hearing, we could probably rule out any direct auditory transmission of information over a 20 mile range. The same might be true of odor or any other traditional sensory experience, except visual stimulation in the sense described, not to each other but to a common stimulus at a distance—the simultaneous impingement of light rays from the moon on each dog.

Before it had been demonstrated by careful experimental study that dogs are sensitive to high pitched tones far above the upper limits of man, it would have been easy to have overlooked the fact that dogs could be in direct auditory communication with one another when at a distance (but not too great for sound transmission). Under such circumstances, in the absence of information about such differential auditory pitch thresholds in man and dog, it would be easy for man to assume a mysterious, and perhaps mystical, explanation of the interaction between two dogs at a distance. Obviously one should check and carefully rule out any possible sensory interaction before seeking other less traditional modes of communication.

The purpose of this afternoon's session is to discuss possible animal experiments which might be brought into the service of the study of psi phenomena, as advocated by Raúl Hernández-Peón. Perhaps some would contend that it should not be expected that psi phenomena could be demonstrated in animals lower than man on the scale in brain encephalization, size, and complexity. Or that the absence of an apparent vocal communication system and of a known language, and a lesser, or absent, ability for abstract thought and problem solution would eliminate the possibility of telepathic communication. Nevertheless, assuming that psi phenomena are more of an emotional than of an intellectual nature, it would seem desirable to undertake some experiments with animals, as some of their behavioral responses might be easier to monitor than in man.

Let me tell you briefly how some of our experiments with monkeys might be adapted to psi requirements. We have trained monkeys to make a visual discrimination and a behavioral response indicative of the correct discrimination.[1] Thus we have substituted the behavioral response (pressing with the hand one of two panels upon which the correct symbol was projected for a very brief period of time) for the visual discrimination.

The experiment goes like this. A monkey sitting in a plastic chair is partially restrained, but has sufficient freedom of movement of both hands to reach out and press the small translucent panels before him at eye level; also to press a programming lever at the start of each trial. The monkey is first trained to discriminate a square from a triangle when both are simultaneously projected onto the translucent panels. After some time he learns to do this with 95-100 percent accuracy when the stimulus is only 10 msec. in duration. Along with learning the discrimination, the entire sequence of each experimental trial has been programmed into the brain of the monkey, namely, to press the lever to start the trial, immediately orient the head and eyes attentively upon the panels where the stimuli will appear in brief tachistoscopic presentation, press one of the panels and if correct obtain a banana pellet. Either a correct or incorrect press terminates a trial and a dim overhead light or a tone comes on for 15 seconds. When the light or tone stops, the monkey presses the programming lever for a new trial and repeats the discrimination procedure.

With this somewhat unusual learned perceptual discrimination based on a very brief tachistoscopic presentation, it has been possible to establish that a monkey can perform a task like this even with interfering stimuli, and that the results correspond very well with those obtained in man. We have used a common visual masking paradigm to provide interference with the basic perceptual discrimination between the square and triangle. That is, after near 100 percent performance is established for the tachistoscopic presentation of the square and triangle, a second, homogeneous light flash of 20 microseconds duration (and usually more intense than the first, longer flash which presents the patterned stimuli) is presented on the same panels. If this second flash occurs within 20 to 35 msec. after the first flash, its interference effect tends to mask at least partially the patterns presented in the first flash, and the monkey's correctness of performance drops from 100 percent to a value between 100 and 50 percent (chance level). If the interval between the flashes is less than 20 msec., masking appears to be complete and the animal cannot perform the task except at a chance level. These temporal limits of interference conform very closely to those of human subjects, who are able to report verbally whether or not they can discriminate two stimuli such as these, or whether they can perceive certain characteristics of a single stimulus when it is followed by a second. Thus it is possible to train monkeys to make reliable responses in a discrimination task which involves split second presentations and decisions.

How could we use such an experimental paradigm in relation to psi phenomena? Monkeys A and B could be trained to discriminate with near 100 percent accuracy a square from a triangle presented tachistoscopically for 10 msec. Then, with monkey A in one test chamber and monkey B in another, the same program of stimulation could be presented to both monkeys simultaneously, except that monkey B would periodically "draw a blank," i.e., no stimuli would appear on his panels and he would be forced to "guess" which panel to press or rely upon some "sympathetically transmitted" influence from monkey A who had stimuli to respond to. The test would be whether monkey B would perform on these trials at a chance level, or, like monkey A, at significantly better than chance level.

CAVANNA: The most difficult part in these experiments would be to motivate the animals to perform on a joint task when they are out of sensory contact with each other. Why would even a trained animal respond to no signal? The experimenter cannot "explain" the psi test situation to the subjects, as he would do with humans. Maybe we should introduce a parameter of emotional commitment between the two animals, something like the mother responding and her child getting a reward. In Mexico we were planning experiments along these lines with Raúl Hernández-Peón.

LINDSLEY: In this experimental design, it would be possible to arrange contingencies forming a closer bond between the animals. For example, it could be planned that both monkeys A and B would have to press the correct panel within a certain brief interval of time in order to receive a banana pellet reward. Thus under certain plans it would become evident to both monkeys that a certain degree of cooperation was required for either or both to benefit. Or the blank presentations could be made to occur periodically for both animals, but never at the same time for each. In this way the pressure would be on each monkey when drawing a blank to make a correct guess in order to enable his cohort, as well as himself, to be rewarded. If performance on blank presentations in the case of both monkeys was no better than chance, it would have to be assumed that nothing had been transmitted; if significantly better than chance, the possibility of telepathic communication between the monkeys would have to be considered, pending elimination of all other possible cues.

Although perhaps a bit "far out," an experiment could be arranged using the masking flash to interfere with the performance of one monkey and make it drop to chance level, while the second monkey was receiving the square and triangle presentations without interferences. The question here would be whether the masked monkey could profit from the performance of the unmasked monkey, or the reverse, whether the influence from the masked monkey would reduce the performance of the unmasked monkey. With electrodes implanted in the optic tract, lateral geniculate nucleus and visual cortex we have been able to study the electrophysiological events in the visual pathways which correspond with the masked and unmasked trials with different interflash intervals.[2] We found that when the masking flash follows the discrimination flash at intervals of 20 msec. or less, so that behavioral performance drops to a chance level (indicating complete interference), no evidence remains of the electrical response to the discrimination flash. When the interval between the flashes is from 20 to 35 msec. and performance is better than chance level, even though the response to the second flash in each of the recording sites overlaps the response to the discrimination flash, it is evident that the interference is not complete and that some information is getting through, enabling the monkey to make a better than chance decision. If the interval is 50 msec. or more, performance is at near 100 percent levels, and even though the response to the second flash overlaps some of the later components of the response to the first flash, it is evident that there is no significant interference. The interference seems to occur mainly in the retina since the recordings from the optic tract represent the activity of the ganglion cells in the retina. In order to push the interaction back to a cortical level, or at least a post-chiasmal level, it is necessary to present the stimuli dichoptically, i.e., the discrimination flash is presented to one eye and the masking flash to the other. In this way no interference can occur in the retina, and any masking effect obtained must be due to interactions taking place beyond the optic chiasm.

These are only a few examples of many possible experiments which might be adapted to the pursuance of psi investigations in animals. In my experience, most of the experiments that can be done with humans can also be carried out with animals, though animals must be trained in such a way that their behavior can be made to substitute for the verbal responses a human subject is able to make in reporting his judgments or discriminations. Similarly shaping and programming of behavior is required in advance in order to be able to communicate to the animal what it is you wish him to do, an instruction which can so simply and easily be transmitted to a human being in verbal terms. The same difficulty pertains, of course, to working with very young children before they have acquired a symbol system with which information and instructions can be imparted to them, and in terms of which they can report back.

CAVANNA: I still fail to see how the two monkeys could realize that they were working together, that they had to develop a joint motivation in pursuit of a common goal. Even if psi occurrences or other factors at play in the experimental situation did lead to rewards because of coordinated responses of the two animals, how would they know where to aim and how to keep their motivation high, if they never received any feedback about the experimental scheme leading to such rewards? We would have to postulate that they would become aware of the experimenter's design, which would entail on their part the capacity for a rather complex conceptualization, of which psi would become only a possible minor component.

On the other hand, in these or other psi experiments, one could use as subjects emotionally linked pairs of animals, and see whether concomitant variations in affective state (as monitored through neurophysiological and/or behavioral responses) could be elicited in both members of a pair when a stimulus was administered to only one of them. Particular conditioning procedures ought to be devised. While reinforcing the joint responses, progressive reduction of sensory cues would have to be introduced. When their complete elimination was achieved and joint responses could still be recorded consistently, psi operation could be postulated as a working hypothesis, on which to base more advanced experimental designs.

PRIBRAM: In my laboratory two monkeys next to each other were first trained to press a bar at various intervals independently of one another, as individuals, and then both would have to press simultaneously in order to get a reward.[3] We saw that the individual response rates had to adjust toward each other, and that it was always the animal dominant in the social setting who adjusted his rate to the submissive one, and not vice versa, which is a fascinating result. Obviously, if you separate the two animals you would have to solve the problem of their commitment in order to be able to make an experiment at all.

MARGENAU: What is the minimal number of photons which will activate the retina?

WALTER: The physiological threshold may in fact correspond to the physical threshold. In other words, the retina can perhaps respond to a single photon. The energy that the brain produces in response to a stimulus may be much greater than the energy of the stimulus itself. Animals show extraordinary sensitivity to molecular structures. They might represent excellent subjects of investigation for "paranormal" transmission. These studies ought to be done by telemetry, though, because the captive animal is corrupted physiologically and often becomes insensitive to natural stimuli. The EEG of a dog on a leash, even so long that he can move around freely, is different from that of a free-ranging dog.

PRIBRAM: That is an excellent suggestion. Unfortunately, the cost of telemetry is still high.

WALTER: It is not higher than that of basic equipment. And an emitter for 16 channels is small enough to be fixed on an animal's head.

PRIBRAM: How would you say that communication had taken place just by looking at the records? Animals cannot tell you through language. Maybe within a few years computer techniques will be at a reasonable price, and the experiments you pointed out could be realized.

Perhaps we could build a model with one EEG, and then test the others against it, just as the brain does, by progressive filtering.

WILSON: What would be the trouble with the program now? If it is the speed of computations and not the ability to get in and out of the computer, six months might be sufficient to see an improvement in computers.

WALTER: I do not think that actual computation time presents any problem, nor programming. Data storage is the problem.

TART: How would one tell if an animal is using psi? There is a lot of folklore about how certain animals are very sensitive to alleged psychic disturbances. Some years ago, I proposed trying to use animals as psi detectors.[4] With today's technological sophistication for recording animals' responses, the sensitivity of such a method could be enormously increased. In one room an animal or a human being would be stimulated to certain emotional states, while in another room the reactions of another animal (the biological detector) would be monitored.

WALTER: In order to do this, you would have to know the repertoire of that particular animal. In order to make a computation of the significance of possible correlation of events, you must know the basic probability of occurrence of the signals, and what any individual signal means. This difficulty could be overcome to some extent by using rather selected species. But there are individual types in all species, and this represents a considerable difficulty. To carry out psi experiments you would have to know an awful lot about your individual animals, not only their overt behavior but also the repertoire of their brain functions. With 50 implanted electrodes per animal, this would be a massive program to handle.

TART: I understand that my suggestion is simple in theory, but in practice it involves a tremendous amount of empirical search for animals that would be specifically sensitive in the experimental situation. One could, however, start with species, such as cats and dogs, which are allegedly hypersensitive to cues from humans.

PRIBRAM: Mr. Webster suggested using plants; one could also think of lower organisms. Bio-assay techniques would fall within the scope of biochemistry.

SILVERMAN: Animal experiments indicate sex differences in sensitivity. Studies of hormone imbalances associated with sensitivity differences in humans suggest that certain patterns of hormone outputs may be responsible for changes in animal sensitivity as well. Perhaps the disposition to psi experiences may also be related to certain hormone response patterns.

PRIBRAM: This would be very difficult to study because of the role of olfactory cues. We would want to be sure the transmission is not sensory.

SILVERMAN: I was suggesting maximizing the probability of finding an effect by selecting those animals who show biochemical response patterns associated with hypersensitivity.

KAMIYA: In the human parapsychological literature it is frequently mentioned that perhaps the psi functions are leftovers of earlier stages of human evolution. More primitive emotional aspects of man are mediated by deeper structures. This suggests some specific research along the animal kingdom to see whether there is any kind of communication between organisms through mechanisms yet unknown. One could investigate the sensitivity of animals to various parts of the electromagnetic spectrum and to very low levels of X-ray radiation, that can be discriminated in a learned response. From space experiments we might learn something about the effects of gravitational fields on perceptual and other capacities in individuals. Even if it is difficult to conceive that this effect would be used by animals as a medium of communication, any knowledge of the range of physical influences on the central nervous system would be important.

Darwin presented us with one of the greatest conceptual schemes for the analysis of behavior. It is high time that we used some of the new behavioral technologies for an analysis of the evolution of consciousness in the entire phyletic kingdom. I suggest that we supplement the ethological studies, which give us one channel of inference about the animal's CNS schematization with respect to behavior, with information on different states of consciousness in animals. For instance, it would be of considerable importance to know at what age the various species begin to enter REM states. We do not even know the answer to that question with respect to the human infant, who at birth shows flat EEGs. Answers to these questions might be very useful for a general theory of behavior, and may open up a new conceptualization for the comprehension of psi phenomena.

CAVANNA: Hernández-Peón and his collaborators had started a phylogenetic mapping of sleep and dream states.

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