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ANIMAL COMMUNICATION 93

Animal communication

A recent experiment on symbolic communication between pigeons is part of an ongoing project being conducted at Harvard University by behaviorist B. F. Skinner and Robert Epstein. Called the Columban Simulation Project (after *Columba livia*, the taxonomic name for pigeon), the project is attempting to simulate complex human behaviors, normally attributed to "cognitive" processes, with

pigeons. Language is only one of many human phenomena being simulated; others are competition and sharing, insight and problem solving, self-awareness, tool use, and so on.

The project has two major goals: to provide plausible accounts of the origins of complex human behavior in terms of specifiable environmental histories, and to provide a data-based commentary on current nonbehavioristic psychology.

Behaviorists such as Skinner are strict determinists. They believe that human behavior—a category in which they include thoughts and feelings—can, in theory, be completely accounted for by a person's genetic endowment, environmental history, and the current circumstances. The role of genes is not yet well understood and is relatively difficult to study experimentally. Experimental psychologists concentrate on understanding the role of the latter two variables. They reject explanations of human behavior based on traits, mental states, or feelings, which are often proffered by cognitive psychologists, popular psychologists, and laypersons. Thus, an insightful performance is not explained in terms of "insight" or other mental operations, but in terms of experience; behavior said to show that one is aware of one's self is not then accounted for by one's "self-concept," but, again, by past events; and language is not explained by "capacities," "traits," "knowledge," or "mental structures," but by a genetic endowment, an environmental history, and current circumstances. The communication experiment was an attempt to show the possible contribution of an environmental history in determining certain languagelike behavior.

The details of the procedure were prompted by recent language research done with chimpanzees. "Symbolic communication" was achieved as follows: One chimp watched a trainer hide some food and then, in the presence of a second chimp, was asked by the trainer to indicate the symbolic name for that food by pressing (and thus illuminating) it on a keyboard. If the second chimp then asked for the food by using its symbolic name (again, by pressing keys), both chimps were fed.

Communication sequence. A variation of this performance was achieved with two pigeons as follows: The pigeons, named Jack and Jill, were placed in a Plexiglas chamber with a Plexiglas partition between them. Each could peck (and thus illuminate) various keys embossed with colors or letters, and each could see the other's keyboard through the partition. Jack's task was to name a color to which only Jill had access. Jack would initiate a conversation by pecking a key labeled WHAT COLOR? Jill would then poke her head behind a curtain where one of three colors (red, green, or yellow) was illuminated. Having seen the color, she would peck (and illuminate) a corresponding black-on-white letter (R, G, or Y) on her keyboard. Jack would then peck a key marked THANK YOU on his keyboard, thus operating a feeder for a few seconds on Jill's side of the partition. Finally, Jack would double-check the illuminated letter on Jill's keyboard and peck the corresponding color on his own keyboard. If his selection was correct, the equipment would automatically operate his feeder. Jack invariably then asked for an-

other color. (Hidden colors appeared in a random sequence.) The pigeons could engage in this exchange with 90% accuracy for sustained periods of time. If they had been responding at random, overall accuracy would have been about 11%.

Although the exchange has been described in terms of "meaning," "information," "knowledge," and "purpose," the animals in fact behaved as they did because of a complicated "history of reinforcement." The experimenters suggest that "a similar account may be given of . . . comparable human language." Consistent with the goals of the project, the adequacy of current popular accounts of language was questioned and a plausible account of certain languagelike behavior constructed based on a specifiable environmental history.

Training. The communication sequence was established after about 5 weeks of training, the major steps of which were as follows:

1. **Adaptation:** The birds were placed in the experimental chamber, one at a time, and housed there for a short time until they showed no signs of distress.

2. **Hopper training:** The food hopper (feeder) was operated repeatedly, giving them access to grain for several seconds with each operation, until they approached and ate from it readily. Since the birds were kept slightly hungry at all times, the operation of the hopper would now serve to strengthen ("reinforce") whatever behavior it followed.

3. **Key pecking:** Pecking any key was reinforced (that is, was followed immediately by a hopper operation).

Jill's training now proceeded in Jack's absence as follows:

4. **Chaining:** What would eventually be the hidden color was at first flush with the panel and not covered by a curtain. A peck at the color (red, green, or yellow) followed by a peck at any of the symbol keys (R, G, or Y) was reinforced.

5. **Matching:** The second peck was reinforced only if the symbol corresponded to the illuminated color. Jill was thus taught to "name" colors.

6. **Shaping:** The color was gradually moved into a recess in the panel and then gradually covered with a curtain.

7. **Discrimination training:** The matching sequence was reinforced only when the WHAT COLOR? sign was illuminated.

Jack was trained in Jill's absence as follows:

8. **Chaining:** The center partition was removed. A peck at an illuminated symbol key (on Jill's side of the keyboard) followed by a peck at a color key (on Jack's side) was reinforced.

9. **Matching:** The second peck was reinforced only if the color corresponded to the illuminated symbol. Jack was thus taught to select the right color, given its "name."

10. **Shaping:** The partition, at first placed directly over the symbol keys, was gradually restored to its proper position. The first response in the chain was now only a "look" rather than a peck.

11. **Chaining:** A symbol key would be illuminated only after a peck at the WHAT COLOR? key.

12. **Chaining:** A peck at the THANK YOU key was required before a peck at a color key would be reinforced.

The two birds were next placed in the chamber together, on either side of the partition. They were housed together until they showed no signs of distress in each other's presence ("adaptation"). With chamber lights illuminated, they would now engage in the communication sequence described above. Errors were followed by brief "time-outs" (all chamber lights were extinguished) throughout training.

Jack and Jill later learned each other's roles and acquired still other languagelike performances.

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