Insight

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People are sometimes surprised by an instant of clarity amidst confusion, a moment where they're tempted to call out "Ah-Ha!" as they solve a challenging new problem or suddenly figure out the solution to a puzzle. This phenomenon is called *insight*, a term that is often associated with concepts such as innovation, creativity, and intelligence. While most examples of problem solving reveal a slow, gradual learning process based on trial-and-error experiences, insightful behavior involves an immediate change in performance as a problem is suddenly and appropriately solved.

There are surprisingly few documented examples of insightful performance in animals. The first was a report by the German psychologist Wolfgang Köhler, entitled *The Mentality of Apes* (1925), which described the responses of a captive group of chimpanzees to a variety of problems created by Köhler, all of which involved obtaining a difficult to reach food reward. For example, after initial futile attempts to leap to fruit that was placed out of reach, the chimps sometimes paused and then used assorted objects found in their enclosure (boxes, poles, sticks, and strings) in new ways and combinations to order to acquir the desired reward.

The performance of the animals on Köhler's puzzles led him to believe that the problems were solved by the chimp's insightful perception of the relevant relationships between the food, the various objects, and the motor behaviors used to connect the two. If this was the case, the notion of insight might explain the sudden and appropriate changes in behavior. If not, how were the solutions to the problems formulated? Later investigators discovered that solutions to similar problems were not readily demonstrated in the absence of prior experience. Chimpanzees often need practice in pushing and climbing boxes, waving sticks and linking them together, jumping with the leverage of poles, and pulling strings, and they get can get this practice through spontaneous exploration and play with the objects found in their environments.

Chimps with a history of such object-oriented experiences are more likely to succeed in overcoming obstacles than those who lack these prior experiences. Direct training on elements of a problem can also facilitate performance. For example, pigeons can be taught to climb on a box to peck at an arbitrary target, such as a plastic banana, and independently taught to push a box from one spot to another. Following training of these behaviors, pigeons will spontaneously push the box to a position under the target and then hop on the box to in order to peck it. Although the elements of the problem-solving behavior are taught to the subject, it still must combine what it has learned into a new behavioral sequence when presented with an unfamiliar situation.

Currently, the study of insight is still a highly controversial topic in the field of animal behavior. Modern studies attempt to improve our understanding of insight by combining analyses of experiential learning with tests that require innovative solutions; for example, *stimulus equivalence* predicts how animals may mentally structure their environmental experiences so that novel behaviors can emerge.

See also Cognition—*Imitation*
Learning—*Social Learning*

Further Resources

Birch, H. G. 1945. *The relation of previous experience to insightful problem-solving.* Journal of Comparative Psychology, 38, 367–383.

Epstein, R., Kirshnit, C. E., Lanza, R. P., & Rubin, L. C. 1984. *'Insight' in the pigeon: Antecedents and determinants of an intelligent performance.* Nature, 308, 61–62.

Köhler, W. 1925. *The Mentality of Apes.* New York: Harcourt, Brace, and Company.

a chimpanzee named Koko was shown an inaccessible piece of fruit hanging from the cage ceiling and a box placed on the floor. Initially, Koko attempted (unsuccessfully) to reach the fruit, but paid no attention to the box; then he directed his attention to the box, throwing it, sitting on it, and directing violent attacks to it; finally, he suddenly turned toward the box, seized it, dragged it beneath the fruit, stepped on it, and took the fruit.

Problem-solving abilities similar to Koko's are observed in animals extensively exposed to various objects and subsequently tested for insight. Suppose a pigeon is separately trained to peck at a stimulus hanging from the ceiling and to push a box placed on the floor by pairing each behavior with food. Evidence shows that, like Koko, this pigeon would first try to unsuccessfully reach for the hanging stimulus and push the box, until it would suddenly exhibit the correct sequence: push the box, step on it, and reach for the stimulus. Insightful problem solving is facilitated by extensive familiarization with a particular set of objects.

Is there any evidence of species differences in the ability to transfer acquired information to new situations? In a series of experiments, several species of primates were trained to discriminate between two stimuli until a criterion of correct responses was reached and, then, additional trials were administered to overtrain the discrimination. How would these animals adjust to a reversal of the original discrimination in which the previously correct and incorrect stimuli are now incorrect and correct, respectively? Overtraining interfered with reversal learning in primitive primates (lemurs, New World monkeys), but it facilitated reversal learning in advanced primates (Old World monkeys, apes). Although all species were able to learn the reversal problem eventually, primate species differ in the way in which they learn. Primitive species learn discriminations by acquiring response tendencies (always reach for a specific stimulus). Response tendencies are difficult to reverse, thus causing negative transfer. In contrast, advanced species acquire rules (choose one stimulus and stay with it if reinforced, but choose the other if nonreinforced). Positive transfer follows from the fact that both the original discrimination and its reversal follow the same rule.

Learning and the Brain

The tendency from negative to positive transfer across primates reviewed previously correlates positively with the species' brain size. Results such as these suggest that having a relatively larger brain may allow an animal to perform more complex forms of information processing and to exhibit greater behavioral flexibility. This also applies to restricted brain areas. For example, if a species is biased toward the use of visual information (as in humans), then the visual system will be relatively larger and more complex than the visual system of a species biased toward a different sensory system.