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# Behavior

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## Challenging Piaget

Much of contemporary elementary education is based on Piaget's theory that people develop specific reasoning abilities in discrete successive stages. Each stage is dependent on the previous one and manifests a more sophisticated use of logic. Thomas R. Trabasso of Princeton University disputes this theory because, he says, it is based on the assumption that all human beings are programmed in the development of their intellectual capacities and that this programming must manifest itself at specific ages, regardless of personal, cultural or environmental experience.

Trabasso has attempted to disprove the assumption by showing that four- and five-year-olds can perform intellectual feats well before the age predicted by Piaget. Transitive inference is one such mental ability. It refers to the ability to make indirect comparisons. If an adult is told that Tom is bigger than Dick and that Dick is bigger than Harry, the adult will infer that Tom is bigger than Harry. Trabasso's four-year-old subjects made such inferences because the experimenters made sure that the children remembered the people and their relative sizes. In such cases, says Trabasso, memory is the key to solving the problem, not mental development. With such evidence Trabasso concludes that "the commitment on the part of schools to a theory which assumes that the development of reasoning abilities is innate and not dependent on learning or experience, permits the schools to attribute success to themselves and to blame failure on the child."

## A mother is a mother is a mother

Harry Harlow's experiments with infant monkeys convinced most researchers of the importance of an infant's desire to cling to a mother, even an artificial cloth mother. Some researchers have concluded that such behavior is learned only in the first 250 days of life, is confined to a specific object and is exclusive and enduring. William A. Mason and M. D. Kenney of the University of California report in the March 22 *SCIENCE* that infant monkeys, whether raised with real or cloth monkeys, can be housed with dogs and form equally strong attachment to the dogs. This attachment can be formed after the first 250 days and can be so strong that a young monkey, when given a choice, will choose to be with a familiar dog rather than an unfamiliar monkey.

## A good night's sleep

Sleeping patterns differ from person to person for a variety of reasons. Jerome L. Singer of Yale University and Ernest Hartman of Tufts University say that the length of time a person sleeps may sometimes be dependent on mental health and be associated with a do-it-yourself form of psychotherapy. They found that people who usually need a lot of sleep (more than nine hours) are often worried or depressed. Short sleepers (less than six hours) are the opposite. They tend to be smooth, efficient and in control of their lives.

The researchers studied the slow and restful synchronized sleep that is associated with physical restoration and the more fitful desynchronized sleep that usually contains dreams. Desynchronized sleep, they suggest, allows people to get in touch with their unconscious and work through problems as they would with a psychoanalyst. Because troubled people need more of this therapy, they tend to sleep longer.

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# Environment

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## When is waste recovery profitable?

Like so many other schemes for saving the environment through conservation and recycling of natural resources, waste materials recovery has been hampered more by economical problems than scientific or technical ones. The Environmental Protection Agency has funded four, 200-tons-per-day demonstration plants and a few communities have taken individual recovery action; but for most towns, there has been little information as to what to expect from expensive, large-scale waste recovery ventures.

Now a group from the National Center for Resource Recovery, writing in March 15 *SCIENCE*, has come up with a set of figures that may help communities make policy decisions in this area. Assuming the need for disposing 500 tons of solid waste each day—enough to serve the needs of a community of 200,000—and the desire to recover such materials as iron, glass, aluminum, some other nonferrous metals and paper, the authors conclude that a plant investment of \$2.4 million would be required.

To make a 15 percent equity return on this investment, a private company would have to go to a community where the current cost of disposing raw refuse is \$7.72/ton and where they can bury or incinerate their own unrecovered residue for \$5.79/ton (a reasonable reduction since the shredded residue is more compact). Meeting this condition would depend, in part, on the price an operator could get when he sold the filled land. The calculations take into account an assumed \$3.60/ton recovery of materials.

If organic residue is used to provide heat for a boiler to run the plant, the operation becomes economical where current dump fees are \$3.96/ton (rather than \$7.72). If in turn, the operating agency is public and requires no profit, the combined system could compete with existing dumps that charge \$2.09/ton for disposing raw garbage. Increasing costs of land and raw materials will surely make waste resource recovery even more attractive.

## Effects of strip mining in the West

With interest increasing in strip-mining vast coal fields in the Western United States, scientists in those states have begun to study what the effects might be on local ecology. A group from the Agricultural Research Service of the U.S. Department of Agriculture in Mandan, N.D., report in the March 15 *SCIENCE* that they find coal seams in their area are interlaced with seams of shale containing large quantities of nitrogen locked into ammonia. When exposed to air, water and bacteria, this nitrogen is oxidized and the resulting compounds can be either harmful or beneficial to plant life, depending on their concentration. Should too many nitrates get into ground water, for example, plants, streams and animals might be poisoned. But conversely, limited amounts of nitrogen from the dug up shale would aid in reclaiming strip mined spoil piles. Very careful handling will be required, the authors conclude, to assure beneficial, rather than detrimental, results.

## Environmental volunteers increasing

The joint Smithsonian Institution-Peace Corps program to send graduate environmental scientists to developing countries is gaining popularity. Requests from participating countries are rapidly increasing, with projects ranging from basic research on ecology in the South Seas to a project for stocking, harvesting and breeding fish in West Africa. Last year, 182 such volunteers were placed.