

Fable: A Lost Child Keeping Warm

Once upon a time a small child became lost. Because the weather was cold, he decided to gather materials for a fire. As he brought objects back to his campfire, he discovered that some of them burned and some of them didn't burn. To avoid collecting useless substances, the child began to keep track of those objects that burned and those that did not. (He organized his information.) After a few trips, his classification contained the information that is shown in Table 1-I.

Table 1-I. FLAMMABILITY

WILL BURN	WON'T BURN
Tree limbs	Rocks
Broom handles	Blackberries
Pencils	Marbles
Chair legs	Paperweights
Flagpoles	

This organization of the information was quite an aid in his quest for warmth. However, as tree limbs and broom handles became scarce, the child tried to find a regularity that would guide him to new burnable materials. Looking at the pile of objects that failed to burn and comparing it with the pile of objects that would burn, the child noticed that a regularity appeared. He proposed a possible "generalization."

Perhaps: "Cylindrical objects burn."

This procedure is one of the elementary logical thought processes by which information is systematized. It is called inductive reasoning, and it means that a general rule is framed on the basis of a collection of individual observations (or "facts"). Of what use is the inductive process? It is an efficient way of remembering.

The next day the child went looking for burnable materials, but he forgot to bring along his list. However, he remembered his generalization. So, he returned to his hearthside hauling a tree limb, an old cane, and three baseball bats (successful predictions!). What's more, he reflected with pleasure that he hadn't bothered to carry

back some other objects: an automobile radiator, a piece of chain, and a large door. Since these objects weren't cylindrical there was no reason to expect them to burn.

No doubt you are ready to complain that this generalization isn't really true! Quite the opposite! The generalization states a regularity discovered among all the observations available, and as long as observations are restricted to objects in the list, the generalization is applicable. A generalization is reliable within the bounds defined by the experiments that led to the rule.

As long as we restrict ourselves to the objects in Table 1-I (together with canes and baseball bats) it is surely true that all of the cylindrical objects burn!



Fig. 1-2. "Cylindrical objects burn."

Because of his successful predictions, the child became confident of his generalization. The next day he deliberately left the list at his campsite. This time, with the aid of his rule, he came back heavily laden with three pieces of pipe, two ginger ale bottles, and the axle from an old car, while spurning a huge cardboard box full of newspapers.

During the long cold night that followed he drew these conclusions:

- (1) The cylindrical shape of a burnable object may not be intimately associated with its flammability after all.
- (2) Even though the "cylindrical" rule is no longer useful, tree limbs, broom handles,

pencils, and the other burnables in Table 1-I still burn.

(3) He'd better bring the list along tomorrow.

But, thinking over the longer list, he saw a new regularity that fitted Table 1-I and the newly acquired information as well:

Perhaps: "Wooden objects burn."

What good is this rule in the light of the earlier disappointment? Well, it caused the child to go back and get that door he had passed up two days earlier, but it didn't lead him to go after the chain, the automobile radiator, or the cardboard box full of newspapers.

Don't think this is facetious - it is exactly what science is all about! We make some

observations, organize them, and seek regularities to aid us in the effective use of our knowledge. The regularities are stated as generalizations that are called theories. A theory is retained as long as it is consistent with the known facts of nature or as long as it is an aid in systematizing our knowledge. We can be sure that some day a number of our present scientific views will seem as absurd as "Cylindrical objects burn." But on that day we will be proud of better views that have been substituted. If you are discouraged by the child's faltering progress - he hasn't yet decided that the box of newspapers will burn - be reassured. This child is a scientist and his faltering steps will lead him to the newspapers. They are the same steps that led us to our present understanding of relativity, to our discovery of polio vaccine, and to our propulsion of rockets to the moon.