approach which is *statistical control.* In some experiments it may be possible —through the use of regression procedures (see Chapter 12)—to remove the effects of a nuisance variable statistically. This use of statistical control is referred to as the analysis of covariance.

CLASSIFICATION OF INDEPENDENT AND NUISANCE VARIABLES

All independent and nuisance variables in behavioral research can be classified in one of three general categories—organismic, environmental, and task variables. In the radiation example, the independent variable of radiation can be classified as an environmental variable. The nuisance variables listed earlier as sex, weight, prior experience, and infectious diseases are examples of organismic variables. The other nuisance variable of temperature variation among the cages is an example of an environmental variable. This radiation experiment does not include a task variable. A task variable could be introduced into the experiment by requiring the rats to perform easy, medium, and difficult visual discriminations before gaining access to food. The effect of the visual discrimination on food consumption represents an additional independent variable that can be classified as a task variable. In the design of experiments, the above classifications may help an experimenter in listing the nuisance variables that should be controlled.

EFFICIENCY AND EXPERIMENTAL DESIGN

An experimenter engaging in research is desirous of arriving at valid conclusions. At the same time he hopes to accomplish this goal as efficiently as possible. Generally several experimental designs can be used in testing a statistical hypothesis. However, alternative designs that are equally valid for testing a hypothesis are rarely equally efficient. Efficiency of alternative research procedures may be defined in different ways. For example, efficiency may be defined in terms of time required to collect data, cost of data collection, ratio of information obtained to cost, and so on. A discussion of relative efficiency by Cochran and Cox (1957, 31) is instructive. A commonly used index for assessing the relative efficiency of two experimental designs is given by the ratio of their respective experimental errors. *Experimental error* refers to all extraneous variation in dependent variable scores that tends to mask the effects of the independent variable. The main sources of experimental error are inherent variability in the behavior of subjects and lack of uniformity in the conduct of the experiment.

A formula that provides insight into factors related to the efficiency of two designs is