s_1 and s_2 because the same subjects are observed under all levels of B. In a type SPF-2.3 design, the main effects of treatment A are said to be completely confounded with differences between blocks or sets of subjects. The main effects of B and the interaction AB are free from such confounding. A confounding scheme in which a treatment is confounded with blocks does not affect the interpretability of the treatment effects, only the precision of the estimate. The effects of treatment A are described as *between-block* (*subject*) effects, while the effects of treatment B and interaction AB are described as *within-block* (*subject*) effects. Tests on B and AB are generally much more powerful than tests on A.

The general designation for a two-factor repeated-measures split-plot design is SPF-*p.q*. According to this designation all lower-case letters before the dot stand for the number of levels of between-block treatments; letters after the dot stand for levels of within-block treatments.

There are many research problems in the behavioral sciences where split-plot designs are especially appropriate. A general problem inherent in all behavioral research is subject heterogeneity. Differences among subjects are often such as to obscure treatment effects. A repeated measures or matched subjects design offers the advantage of controlling subject heterogeneity. In addition to this advantage, a repeated measures design is particularly useful in assessing certain types of treatment effects. For example, in experiments designed to investigate learning, transfer, fatigue, and so on, the use of repeated measures on the same subjects is often the simplest way to investigate the research problem. Randomization of the order-of-treatment level presentation for these kinds of variables is not always feasible, for the nature of the treatment dictates the order.

A LIMITATION OF THE USE OF REPEATED MEASURES

A word of caution concerning the use of repeated measurements on the same subject is in order. When matched subjects are assigned to within-block treatment levels, it may be assumed that estimates of treatment effects that have been obtained from the q cells are correlated. The model underlying type SPF-*p.q* designs permits a particular kind of statistical dependency between observations in the q levels of B but requires that the error portion of these scores must be independent of each other and the treatment effects. There is ample reason to believe that in repeated measures experiments the error components of the scores are not independent and that the variance-covariance matrix departs from the required form. That is, the $q \times q$ repeated measures dispersion matrix does not have all diagonal elements equal to σ^2 and all off-diagonal elements equal to $\rho\sigma^2$. Procedures for investigating this issue are presented in Section 8.5. Bargmann (1957) presents a comprehensive discussion of homogeneity assumptions in repeated measures designs. Lana and Lubin