R. A. Bailey: *Block designs for experiments: from microarrays to orthogonal arrays*

Comparative experiments are undertaken in many branches of science and technology. The items compared may be biological samples taken from diverse sources; different temperatures for mixing the ingredients of a medical pill; different lengths of time for hardening a material; different protectants for stone in architecture; different feeds for cattle; and so on. If there are not sufficiently many experimental units that are all alike then the experiment needs to be conducted in blocks, where each block consists of similar experimental units: for example, all mixtures made by one technician on a single day. An extreme example is provided by microarray experiments, where only two items can be compared at a time.

Ideally, every item to be compared appears in every block, but this is not possible when blocks are too small, as they are in micorarray experiments. When there are fewer experimental units in a block than there are items to compare then there is an important question about the best way to allocate the items to the blocks. I shall describe what properties of a block design make it good in the statistical sense of providing the most information for the resources used. This touches on several interesting parts of combinatorics, such as strongly regular graphs, 2-designs and orthogonal arrays. I will not assume familiarity with any of these things.