occurred, since the inception of the polyploid, such that pairing is restricted to homologous chromosomes only.

This method of recognizing the genetical control of the cytologically diploid behaviour of allopolyploids can be applied to *Nicotiana tabacum*. Again it is easy to demonstrate the equivalence of the diploid genomes both to their respective genomes in the allopolyploid and also to each other, while the polyhaploid of *N. tabacum* shows almost no pairing.

The effective isolation of genomes in allopolyploids, when the same genomes can pair in diploid hybrids, provides a generalized method for recognizing the genetical control of the diploid-like behaviour of the allopolyploids. Theoretically, the method is applicable to any allopolyploid, but it is difficult in practice to accumulate sufficient data to make a complete cycle of comparisons. Because of the generalized nature of the method, it lacks the precision of the situation in wheat where a single chromosome arm can be held responsible for the effect. However, the method is applicable to all cases where the parents and a haploid of the allopolyploid are known and therefore can be used, even when a complete range of aneuploids is not available.

It is not possible in cotton, at the present, to obtain information on the mode of action of the genetical diploidization, and it would be unwise to assume, *a priori*, that the functioning is identical to that in wheat. However, with the development of a monosomic series in cotton more precise information may be obtained.

Other allopolyploid species may also have become diploidized by genetical processes and not by the slow accumulation of many small structural changes in the chromosomes. The efficiency of a single-step change, if the diploidization is governed by a single gene, to regular meiotic behaviour presents an attractive hypothesis. This hypothesis is conceptually simpler than that required to explain the vague and randomized processes of the addition of small chromosomal changes to already existing alterations. The acceptance of the idea that allopolyploids other than wheat have become diploidized by genetical processes does not mean that some species may not have a regular chromosome behaviour that is governed solely by differential affinity[4]. However, it is worth while considering that, for an allopolyploid to be formed, first of all an F_1 hybrid must be made. The occurrence in Nature of an F_1 hybrid implies some similarity of the two parental species. If the species are so similar that they are able to hybridize, then their chromosomes will rarely be so dissimilar that pairing is entirely autosyndetic in the derived allopolyploid.

The impact of genetical diploidization on a raw allopolyploid needs little stressing. A single-step change that could confer regular chromosomal pairing and a resultant rise in fertility would have such an evolutionary potential that it would become rapidly selected to fixation.

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STATISTICS

A Combinatorial Assignment Problem

In an establishment, there are $v = nk$ officers, r departments and k types of jobs in each department. Each officer has to be assigned a job in each department such that in any department there are equal numbers of officers in different jobs and any two officers have common jobs in exactly λ departments.

It may be seen that the combinatorial problem is the same as that of a resolvable balanced incomplete block design for $v = nk$ varieties, r replications and k plots per block[1]. We have to identify varieties with officers, replications with departments, and blocks in a replication with jobs in a department. We have the obvious identity $\lambda(v-1) = r(k-1)$.

An important case is when $n = k$. The question arises : What is the smallest value of λ for which the problem admits a solution for any given number k ? We thus have a classification of numbers by this minimum λ.

When k is a prime or a prime power it is known that $(k-1)$ mutually orthogonal Latin (Euler) squares exist[2,3]. Let the cells of a $k \times k$ square be taken as officers, the rows as different jobs in the first department, the columns as different jobs in the second department and the letters of the ith Latin square as different jobs in the $(i + 2)$th department. This provides an assignment of jobs to the officers such that any two officers have a common job only in one department (by virtue of the orthogonal property of the Latin squares). Thus in this case $\lambda = 1$, and therefore all primes and prime powers are of type 1.

For $k = 6$, which does not admit even two orthogonal squares, the solution is impossible with $\lambda = 1$. I have been able to find a solution with the next number $\lambda = 2$. Represent the 36 officers by pairs of residues (x, y) mod (5, 7) and an invariant number I. Consider the arrangement in two departments.

Job	Department 1	Department 2
1	01, 06, 12, 15, 23, 24	01, 06, 32, 35, 13, 14
2	11, 16, 22, 25, 33, 34	11, 16, 42, 45, 23, 24
3	21, 26, 32, 35, 43, 44	21, 26, 02, 05, 33, 34
4	31, 36, 42, 45, 03, 04	31, 36, 12, 15, 43, 44
5	41, 46, 02, 05, 13, 14	41, 46, 22, 25, 03, 04
6	00, 10, 20, 30, 40, I	00, 10, 20, 30, 40, I

Adding unity to the second member of each pair (x, y) in the arrangement for any one of the two departments and reducing to mod 7, and keeping I unchanged yields the arrangement for another department. This operation applied to the arrangements for the first two departments leads to the arrangements for two other departments, which by the same operation provides two other arrangements and so on. We thus derive the arrangements for all the fourteen departments. It is not known whether the problem can be solved for any k, with $\lambda = 2$. The next number to investigate is 10, which is unlikely to have 9 mutually orthogonal squares. An arrangement with $\lambda=4$ is, however, possible. In any event, the open problem is that when a number k is not a prime or a prime power, can we say that it belongs to at least type 2 ?

The combinatorial problem of assignments is thus a general formulation of a wider variety of problems than the problem of orthogonal Latin squares.

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