pened the bivalent normal chromosome 10 appeared to have four short arms which are alike. Sometimes the short arms oriented in such a way that they formed a closely associated quadrivalent. In such cases they appeared to exchange their partners throughout their length.

In order to determine the frequency of the association between the telocentric bivalent and the chromosome 10, about 50 microsporocytes were studied. In about one-half of the cases the bivalent chromosome 10 was associated with the telocentric bivalent and in about a fourth of the cases the telocentric bivalent was left free in the cells. Whenever it was not associated with any of the chromosomes it was usually located in the periphery of the sporocytes. Less frequently this telocentric bivalent was paired with the other chromosomes rather than that of chromosome 10. Occasionally this telocentric bivalent was associated with the B-chromosome at the centric regions.

At anaphase I the telocentric bivalent always failed to divide. Instead of two, it moved to one pole only. Therefore its distribution in the subsequent divisions would be irregular.

Y. C. Ting

9. Association between B-chromosome and abnormal chromosome 10.

In the plants of a cross heterozygous for an abnormal chromosome 10 and also carrying a bivalent B-chromosome, it was found that the heterochromatic part of abnormal 10 was sometimes associated with the B-chromosome. In other instances only the knob-like region of the B-chromosome was paired with the abnormal chromosome 10 at a point of the latter's extra piece of heterochromatin. A few times the paired portion of the attached heterochromatic fragment involved its entire length. More frequently, however, the attached heterochromatic fragment was fused with the knobs on various chromosomes. These observations show that the attached heterochromatic portion of the abnormal chromosome 10, the knobs of various chromosomes, and the B-chromosomes have a high degree of "homology."

Y. C. Ting

10. The blotching system involving the c locus.

In earlier reports it was stated that there are four genes involved in the blotching system which causes blotches of color to develop in the aleurone in A c R genotypes. This conclusion was based on populations which had ratios closely approaching 81:175, the ratio expected when four factors are segregating. In last year's News Letter, because only three different testers could be isolated, it was concluded that only three genes are involved in this system. Now it appears that the earlier reports were more nearly correct than last year's.

The inbred strain Oh45, which is not itself blotched, proved in test crosses to be homozygous for the Bh factors on chromosome 4, 6, and 9. This suggested that there must be at least one more Bh factor in the system and that this factor was absent in Oh45.

Since Oh45 is rr and the three Bh testers are RR we should expect 9:7 ratios in the $F_2$ generation of the crosses between these stocks if the crosses are heterozygous for only one Bh gene and 27:37 ratios if they are heterozygous for two Bh genes.

In the cross of Oh45 with the tester for the Bh gene on chromosome 6 the segregation was 773 blotched:1064 not blotched on three ears—almost a perfect 27:37 ratio indicating that two of the Bh genes in addition to the R gene are segregating. On a fourth ear the ratio was 261:252 which is significantly different from either a 27:37 or a 9:7 ratio.

In the $F_2$ of the cross of Oh45 with a tester for Bh on chromosome 4, four ears segregated alike producing 621 blotched:1340 nonblotched—a perfect 81:175 ratio—indicating that this cross is segregating for four factors: R and three Bh genes. Since only one of the recessive bh genes is contributed by the Bh tester, the other two must come from Oh45.

In the cross of Oh45 with the tester for Bh on chromosome 9, four ears were similar in their segregation producing 780 blotched: 1304 nonblotched seeds. This ratio differs significantly from either a 27:37 or an 81:175 ratio. The results may represent modifications due to linkage or the presence of a gametophyte factor.

The results, though in some respects somewhat inconsistent, indicate that at least four and possibly five factors are involved in this Bh system. The reasons for the modified ratios remain to be determined.

Additional data on linkage relations indicate that the Bh gene on chromosome 4 is located on the long arm since it shows almost no linkage with $de^{tl}$ which is located on the short arm. Data presented in last year's News Letter indicated that the Bh gene on chromosome 9 is located on the long arm. More recent data showing 45.3% crossing over between Bh and Sh and 47.5% between Bh and Wx tend to confirm this.

P. C. Mangelsdorf

11. Number of genes in the r-R blotching systems.

Previous data have indicated that the number of genes involved in this system might be as high as six or seven. For some reason it has not yet been possible to isolate testers for all of these. Data ob-