Under the South African climatic conditions and with the particular microbiological constitution of our soils it seems, therefore, as if pericarp injury of maize seed is not of such paramount importance as described for American conditions. The South African problem therefore calls for further investigation.

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1. The Wx/wx Locus.

A. Evidence of a different physical basis for intragenic and intergenic recombination in maize.

Heterozygosity for Dp 9 has been reported by Rhoades in these News Letters (32 and 34) to have a marked suppressive effect on recombination between loci in the short arm of Chromosome 9. Because of this pronounced effect on intergenic recombination it has seemed most desirable to test its effect on intragenic recombination in the Wx/wx locus. If, as some geneticists have suspected, there are different mechanisms for intra-and intergenic recombination, it might be possible to find agents which would affect one type of recombination without affecting the other as markedly or at all.

Accordingly, the heterozygote + + Dp + +/c sh N wx Gl_{15} as received from Rhoades was crossed by c +sh N wx^{90} + gl 15 in the 1960 greenhouse. In the 1960 growing season + + Dp + + gl 15/c + N wx^{90} + was crossed by c sh N wx^{s} gl_{15}. The colored waxy kernels which are crossovers should be + wx^{90} +/c wx^{s} gl_{15} and should nearly all carry Dp 9 (see Rhoades, M. N. L. 32). Such kernels from 3 ears were planted in the greenhouse in the late summer of 1960 together with colorless waxy c wx^{90} +/c wx^{s} gl_{15} kernels from the same ear as a control population. Subsequently, the C wx crossover class from other ears were planted without a corresponding control population. Pollen was collected on all plants, and the plants were pollinated by the c sh N wx^{s} gl_{15} stock, if possible. If such a pollination was not possible, the plant was selfed.

Pollen from all plants has been scored for frequency of $+^{wx}$ pollen grains. The presence of Dp 9 in plants suspected to be carrying it has been checked by the reduction in recombination between sh and gl15. Alternatively, in selfed plants where seedling tests have not been completed yet, the presence of the Dp 9 is revealed by an excess of sh kernels.

Table I gives the pollen analysis data. These data are more heterogeneous than customary in crosses between two wx alleles. Probably the heterogeneity is attributable to the difference in genetic background between plants introduced by the crosses necessary to set up the test. All plants indicated as carrying Dp 9 have been checked for its presence.

The wx^s allele in the tester stock has never been crossed to wx^{90} previously. However, all wx tester stocks seem to contain the same allele which is the one we have designated as wx^c. The expectation, then, in crosses with wx^{90} is for a $+^{wx}$ frequency between 75 x 10^{-5} (1958 Greenhouse) and 102 x 10^{-5} (1960 Field) observed under different growing conditions and in crosses between stocks of somewhat different genetic backgrounds. Because of the small number of plants tested and the heterogeneity of the data it is not possible to decide whether there is any significant difference in $+^{wx}$ frequency between plants heterozygous for Dp 9 and homozygous normal plants. There is an indication that this is so. It is clear, however, that a relatively high frequency of $+^{wx}$ pollen grains can occur in plants heterozygous for Dp 9. In view of the suppressive effect on intergenic recombination of the duplication when heterozygous, it is suggested that the fact that intragenic recombination is little affected is evidence for two different types of recombination.

B. Comparison of $+^{wx}$ frequency estimated by pollen analysis and conventional techniques.

Last year using $+^c$ + + wx^{90} +/+ sh bz wx^{coe} v as both male and female parent in backcrosses to $+^c$ sh bz wx^{coe} v, the frequency of $+^{wx}$ kernels was 72 x 10^{-5} when the F_1 was the female, but only 19 x 10^{-5} when the F_1 was used as the male. The $+^{wx}$ frequency in the pollen of the F_1 was 90 x 10^{-5}. The detection of the $+^{wx}$ kernels was visual. It was suggested that the disparity between the F_1 as a male and as a female parent was due to a dosage effect when some of the recombinants were not fully functional $+^{wx}$ alleles.

The same type of test has been repeated in 1960. However, each kernel has been tested with the standard KI, I_2 stain. The frequency of $+^{wx}$ pollen grains in the F_1 plants was estimated as 102 x 10^{-5} with an estimated population of 435,000 pollen grains being scanned. The frequency of $+^{wx}$ kernels on the ears is given in Table 2. Of the $+^{wx}$

TABLE I

Frequency of $+^{wx}$ pollen grains in the cross between wx^{s} and wx^{90} in the presence and in the absence of Dp 9. *

$\frac{+ \; + \; +^{bz} \; Dp \; wx^{90} \; +}{c \; sh \; + \; N \; wx^{s} \; gl_{15}}$			$\frac{c \; + \; +^{bz} \; N \; wx^{90} \; +}{c \; sh \; + \; N \; wx^{s} \; gl_{15}}$		
	$+ \times 10^{-5}$	Population		$+ \times 10^{-5}$	Population
615A1	33	70,000	616A1	174	62,000
			616A2	90	51,000
617A1	60	66,500	618A1	107	44,000
617A2	41	74,000	618A2	55	42,000
617A3	56	61,000			
611A2	40	108,000	6112A1	61	61,000
			6112A2	82	76,000
6161A2	37	13,500			
6162A1	28	83,000			
6163A1	66	59,000			
6163A8	58	36,000			
6163A9	48	72,500			
6163A11	38	72,000			
6163A12	46	61,000			

* 615A and 616A, 617A and 618A, 6111A and 6112A constitute paired comparisons from the same cross.

Table 2. Backcrosses of (wx^{90} x wx^{coe}) with wx^{coe}

Cross	Number of Kernels	Number $+^{wx}$ k.	$+^{wx} \times 10^{-5}$
$\frac{+ \; wx^{90} \; +}{bz \; wx^{coe} \; v_1}$ x wx^{coe} v	17,600	14	80
bz wx^{coe} N x $\frac{+ \; wx^{90} \; +}{bz \; wx^{coe} \; v}$	51,191	54	105

kernels tested to date, 86 percent carry one or both of the outside markers, and contamination can be excluded as their source (see Table 3). The ear and pollen analyses agree much better than in 1959. Apparently use of the stain is necessary to detect many $+^{wx}$ recombinants particularly when aleurone color is present. Whether or not $+^{wx}$ alleles of less than standard strength are produced by recombination is under investigation.

C. The assortment of outside markers in $+^{wx}$ recombinants.

In the 1960 M. N. L. the assortment of outside markers for the 27 $+^{wx}$ recombinants was given as 2 $+^{bz}$ $+^{v}$, 7 bz v, 6 $+^{bz}$ v, and 12 bz $+^{v}$. Subsequent pollinations of these plants with the bz wx^{coe} v tester showed some of these classifications to be in error since some lightly-colored kernels classified as bz were in actuality $+^{bz}$. The revised classifications are presented in Line 1 of Table 3. Also in Table 3 are the classifications of the $+^{wx}$ kernels from the 1960 field which have so far been grown. The data indicate that the order for the wx mutants is bz wx^{c} wx^{90} v.

The same pattern is found in both years, and it is not in accord with expectations if an orthodox crossing-over event between wx^{90} and wx^{coe} gave rise to the $+^{wx}$ gametes. If so, even assuming no interference of this crossover with crossovers between bz and wx or between wx and v, one expects a higher frequency of one cross-over class ($+^{bz}$ v) and lower frequencies of the two parental classes. At the same time, the frequency of crossovers is much higher than in the population of gametes as a whole. This is the "correlation effect" observed so often in such experiments in Neurospora and Aspergillus.

Table 3. Assortment of outside markers in $+^{wx}$ kernels.

Year	$+^{bz}$ $+^{v}$ (P1)	bz v (P2)	$+^{bz}$ v	bz $+^{v}$
1959	4	4	7	1
1960	6	12	24	1

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