The proportion of the recombinant classes of kernels on the ear of the 6704B-4 parent plant and on that of its Y Spm/y+ progeny, entered in table 45, was much the same, and this amounted to approximately 18 percent of the total number of keernels. It will be recalled that the same relative stability of location of Spm was exhibited by the Spm in plants in culture 6629A that were Y Spm/y + (table 5) and by the majority of their Y Spm/y + progeny (table 29). However, in these plants, Spm occupied a position in chromosome 6 more distantly removed from Y. The recombinant classes amounted to approximatel 35 percent. This same stability of location was expressed by Spm when it occuppied a position in chromosome 6 quite close to Y, and this was shown in plant 6895A-1 and its progeny (table 43). In contrast to this, in the two cases examined in detail where Spm was located in chromosome 9, Spm underwent many transpositions and many of these, in turn, occurred early in plant development. That the chromosome in which Spm resides may be an ~~is not~~ important factor in ~~in itself the~~ only ~~important~~ factor controlling Spm behavior is possible but it was shown by a case in the a_2^{m-1} cultures in which it was carried in chromosome 9. This case ~~has been~~ was examined more extensively than any other. This Spm, residing at a site close to Wx, remained ~~quite~~ relatively stable in this location, ~~although~~ transpositions of it does occur, although usually late in development of sporogenous or spore cells. Since this case has contributed much to an ~~understanding~~ appreciation of inactivation of Spm, discussion of it will be postponed until this subject is considered. At this time, however, another case of insertion of Spm in chromosome 9 will be considered as it serves as an excellent illustration of the high proportion of transposed Spm in the Spm carrying recombinant class of kernels that may be present on a test cross ear. It will be necessary to consider first, the origin of the plant having Spm at this location (plant 6671F-2).

Progeny Test 18, figure 1

In the case ~~now~~ to be considered, ~~the~~ Spm was located in the wx carrying chromosome 9 of a Wx/wx plant and at a position that was probably very close to wx. It was present at this location in one plant in the tested progeny of plant 6629A-5 (table 5). In plant 6629A-5 two Spm elements were present one of which was located in its Y bearing chromosome 6. Tests were conducted with progeny derived from kernels on the ear of the main stalk of this plant and on that of its tiller. These plants were grown in the summer of 1954 under culture numbers 6671 and 6672.

From the ear of the main stalk, the Spm constitution was determined in 20 plants derived from colorless, sh_2 kernels, 14 of them from the Y class (culture 6671F) and 8 of them from the y class (culture 6671G). From the tiller ear, 27 plants derived from colorless, sh_2 kernels were examined for Spm constitution, 14 of them from the Y class (culture 6672E) and 13 of them from the y class (culture 6672F). Among the total of 28 plants derived from the Y kernels on these two ears, no evidence of the presence of Spm was given by ~~the~~ any kernels on the testcross ears produced by 13 of ~~them~~ these plants. Among the 15 plants having Spm, one Spm was present in ~~[illegible]~~ 10 of them, ~~and~~ more than one Spm element was present in each of the other five plants. Spm was linked with Y only in two of ~~the~~ these ten plants (6671F-1, 6672 E3, table 46) having one Spm, and certainly with wx in ~~two~~ one other~~s~~ (Plant 6671F-2, table 47) and possibly with wx in a fourth (Plant 6672 E-4, table 47). In 4 of the remaining 6 plants in which one Spm was present, linkage of it with either Pr or wx could not be determined as all these plants were ~~pr~~/pr, Wx/Wx in constitution. The other two plants were heterozygous for alleles of these two markers but no linkage of Spm with either of them was expressed. Two Spm elements were present in each of 4 of the 5 plants with more than one Spm element in them. Linkage of one of the Spm elements with Y was expressed in one of these 4 plants (plant 6672 E-1, table 46). In the fifth plant that had more than one Spm element in it, at least 3 and probably 4 Spm elements were present.

Of the 19 tested plants derived from the colorless, sh_2, y class of kernels in cultures 6671 and 6672, the testcross ear produced by two of them showed no evidence of the presence of Spm in any one kernel. The testcross ear produced by the remaining 17 plants showed that each had Spm, one being present in 16 of these plants and two being present in the remaining plant. Linkage of Spm with wx could have been detected only in 6 of these plants. Linkage of it with Pr could have been detected in 10 of them. However, no clear evidence of linkage of Spm with these markers was expressed in any one ~~of~~ of these plants in which this could have been detected.

On three of the thirty-three ears produced by the Spm carrying plants in cultures 6671 and 6672 a large sector appeared in which all kernels within it were pale colored. This indicated that in each of the three plants on whose ears these sectors appeared a change had occurred to Spm early in development of the plant. Progeny Test 19, figure 2

Cf

H~~owever~~, P~~p~~rogeny tests were derived from plant 6629A-5 and it was with conducted only with one of the plants in the~~se~~ two cultures, that in which Spm was carried close to ~~in the~~ wx in ~~bearing~~ chromosome 9. ~~in which it~~ ~~and, showing 19 percent recombination with it~~ (plant 6671F-2, table 47). Six plants were grown from the Y and Wx class of variegated kernels on the testcross ear of this plant under culture number 6873A and six other plants were grown from the y and Wx class of variegated kernels under culture number 6873B. With respect to Spm and the alleles of Wx, all plants were derived from the Spm carrying recombinant class of kernels on this ear. All 12 plants were variegated.

Eighteen test cross ears were obtained from 9 of the 12 plants in culture 6873~~xandxallxofxthemxwerexvariegatedxx~~ One Spm was present in all tested parts of 7 of these plants and in none of them was it linked with Wx (table 47). In one plant, 2 Spm elements were present in the two tested parts of this plant. Neither of them was linked with Wx (plant 6873A-3 table 47). In the remaining plant, at least 3 Spm elements were present in each of the three tested parts of this plant (plant 6873B-1, table 47). It may be mentioned also that in none of the four tested plants that were Y/y in consitution was evidence given of linkage of the Spm in them with Y.

In the Spm carrying parent plant of those in culture 6873, Spm was closely linked with wx (Plant 6671F-2, table 47). Of the 169 variegated kernels on its testcross ear, only 29 were in the Wx class. As the described tests conducted with plants derived from 9 of these 29 kernels indicate, none of these 9 kernels ~~arose~~ represent cases in which their phenotype appeared as the consequence of crossing over between Spm and that of wx. Transposition of Spm was responsible for their appearance in this recombinant class of kernels. It is suspected, therefore, that Spm in the parent plant, 6671F-2, was located very close to wx and that the majority, if not all, of the recombinant classes ~~arose~~ would have arisen as the consequence of a premeiotic transposition of Spm.

Before tests of the Spm constitution in the progeny of plant 6629B-5* (table 30) are considered, those conducted with the second generation progeny of plant 6629A-2 will be ~~considered~~ presented. The first generation progeny of this plant ... This second generation progeny was derived from those plants in the immediate progeny of plant

[illegible] ent

* This plant was considered in the preceding section of the third.

6629A-2 in which a transposed Spm was present. They represented the few cases in which a transposed Spm element was found to be present in the progeny of plant 6629A-2. This plant was Y Spm/y+ in constitution as were most of its Y bearing progeny that carried Spm. However, the single Spm present in plants 6665G-12 and 6665G-21 was not linked with Y (table 24). Plant 6665E-10 (table 26) ~~had~~ 2 Spm elements, neither of ~~which~~ was linked with Y in the two ~~tested~~ parts of this plant. The ear of the main stalk of plant 6666C-2 had a ratio of kernel types ~~that~~ suggested that the Spm in it was not as closely linked with Y as it was in the tiller of this plant (table 26). Tests of Spm number and location were made with the progeny of each of these plants, and those conducted with ~~that~~ of plant 6666C-2 will be considered first.

Progeny test 20, figure 2

Nine plants were grown from the variegated Y class of kernels on the ear produced by the main stalk of plant 6666C-2 (see table 26 for kernel types on this ear). All of them were variegated. A testcross ear was obtained from each. One Spm was present in 8 of these 9 plants. It was linked with Y in 6 of the 8 plants having one Spm, (table 48), and possibly with Y in another (plant 6869-8, table 48), but it was not linked with Y in one plant (plant 6869-2, table 48). In the one remaining plant, 6869-9, two Spm elements were present, neither of which appeared to be linked with Y (table 48).

The ratio of kernel types on all the ears produced by the six plants having 1 Spm linked with Y was not ~~consistent~~ the same. ~~for all of them~~ this, suggest~~ing~~s that the location of Spm in chromosome 6 might not be the same in each of ~~them~~. However, no ~~progeny~~ tests that would establish this were conducted with the progeny of any one of them.

Progeny Test 21, figure 2

Eleven plants were grown from the variegated Y class of kernels on the testcross ear produced by plant 6665G-16 (table 24) under culture number 6866. Testcross ears were obtained from 9 of these 11 plants. One Spm was present in the tested parts of 7 of these 9 plants and it was not linked with Y in any one of them. The cmmbined ratios of kernel types on the 8 testcross ears obtained from them are given in table 49. The tested part of one plant (6866-2, table 49) had two Spm elements, neither of which was linked with Y. In the remaining plant ~~of this progeny,~~ (plant 6866-5, table 49) 3 Spm elements were present. These ~~evidence obtained from~~ tests of the progeny of plant 6665G-16 ~~established~~ confirmed the conclusion drawn from direct tests of it that the Spm in it ~~the presence in it of a transposed Spm that~~ was not carried in chromosome 6 close enough to show linkage with Y.

Progeny Test 22, figure 2

~~Progeny~~ Tests of the progeny of plant 6665G-21 were conducted with 8 plants grown from the Y class of colorless, sh_2 kernels on the self-pollinated ear of one of its tillers under culture number 6863, and ~~from~~ with 17 of the 20 plants in culture 6867 that were derived from the variggated Y class of kernels on the ear whose kernel types are entered in table 24. In culture 6863, ~~the kernel types on the test cross ear produced~~ the test cross ear produced by one plant that was Y/Y gave no evidence of the presence of Spm in it ~~the tested part of this~~

Five other plants in this culture had one Spm element. Four of them were Y/y, but in none of these plants was evidence given of linkage of Spm with either of these alleles (table 50). The ratio of kernel types on the test cross ear produced by two other plants, both of which were Y/y, suggested that in each of them an Spm element was carried at the same location in each member of an homologous pair.(plants 6863-3 and 6863-9, table 50).

Of the 17 plants derived from kernels on the testcross ear of this same plant, 6665G-21, 16 had one Spm. Clearly, it was not linked with Y in 15 of these 16 plants (table 50) nor with Pr or Wx, which could be determined at the same time on each ~~the~~ testcross ear, ~~of these plants~~. In one of these 16 plants, however, the single Spm in it probably ~~possibly~~ was carried in the Y bearing chromosome 6, as the ratio of kernel types on its testcross ear suggests (plant 6867-9, table 50).

Thus, the tests of the progeny of plant 6665G-21 conform with that which could be expected if the Spm element in it had ~~was~~ not been carried in chromosome 6 at a position that would give evidence of this by expression of ~~of~~ linkage with Y. In the one plant in which Spm appeared to be linked with Y, a successive transposition ~~of it~~ could have returned it to a location in chromosome 6 that would express linkage with Y. Two Spm elements were present in the remaining plant (plant6867-18, table 50) neither of which was linked with Y nor with Pr or Wx.

Progeny test 23, figure 2

The kernel types on each of the two testcross ears of plant 6665E-10 indicated the presence of 2 Spm elements in both tested parts of this plant. Neither Spm was linked with Y (see table 26 for kernel types on each of these two ears). Fifteen plants were grown from the Y class of vareigated kernels on the ear produced by the main stalk of this plant. One testcross ear was obtained from each of these 15 plants. In one plant, both the appearance of the plant and of the kernels on ~~the~~ its testcross ear gave no evidence of the presence of Spm, ~~in this plant~~. In 11 plants, one Spm was present and it was not linked with Y (plants in culture 6864, table 51), nor with Pr or Wx. Two plants had 2 Spm elements. In one of them, no evidence was given of linkage of ~~an~~ Spm with Y (plant 6864-7, table 51). In ~~other~~ the other, however, the ratio of kernel types suggests linkage of one Spm with Y. ~~was probable~~ (plant 6864-3). In one plant (6864-12, table 51) 2 or ~~more probably~~ 3 Spm elements were present adn the ratio of kernel types on this ear suggests that one of them may have been carried in the y bearing chromosome 6.

All 14 plants derived from the Y, variegated class of kernels on the testcross ear of the tiller of plant 6665E-10 carried Spm. One Spm was ~~carried~~ present in 12 of them and it was not linked with Y (plants in 6865, table 51) nor with Pr or Wx. Two plant (6865-1 and 6865-12, table 51) had two Spm elements, neither of which was linked with Y nor with Pr or Wx;

Two exceptionsl plants appeared among the 28 in the progeny of plant 6665E-10 that were examined. In each of them, at least 2 Spm elements were present in the tested part of theplant. In one plant, one of these appeared to be located in its Y bearing chromosome 6. In the other, one Spm appeared to be carried in the y bearing chromosome 6. No progeny tests were conducted to establish the location of Spm in either plant. Since only one testcross ear was obtained from each plant, the constitution of Spm in other parts of these two plants is not known. However, an early occurring transposition of Spm may have been responsible for insertion of an Spm element into the y bearing chromosome 6 in plant 6864-12. This chromosome, contributed by the tester stock did not have Spm in it. It ~~is evidentm however,~~ appears from the ratio of kernel types on the testcross ears entered in table 51, that plant 6665E-10 did not carry an active Spm in its Y bearing chromosome 6.

Progeny test 24, figure 2

The ratio of kernel types on each of the three testcross ears produced by plant 6629B-5 is entered in table 8. This plant was y/y, Pr/pr, Wx/wx in constitution. From the ratio of pale to variegated kernels on these ears, it could be suspected that this plant had two Spm elements, both of which resided in one chromosome of the complement. The pollen parent that had been used in making the cross with the first ear on the main stalk and with the tiller ear had been homozygous for a_1, sh_2, y, Wx, and Pr. That used in making the cross with the second ear on the main stalk had the same constitution except that it was homozygous for pr. Although this ear had only a few kernels on it, the ratio of pheno types among ~~them~~ suggested that the Spm elements in plant 6629B-5 were ~~was~~ carried into chromosome 5 with pr. ~~linked with Pr~~. Kernels were selected from each of the three ears of this plant and sown in the summer of 1954 under culture numbers 6683 to 6685, as indicated in table 18. From the second ear on the main stalk, plants were grown from kernels having several different phenotypes with respect to a_1-m-1 expression ~~the pale, Sh_2, Pr~~ including ~~class of kernels and~~ 3 that were ~~grown from the~~ variegated, Sh_2, and Pr, ~~class of~~ these latter 3 were, therefore, "recombinants" with respect to Pr and Spm. ~~kernels in addition to the 16 that were derived from the colorless, sh_2 class of kernels on this ear~~.

Because it had been suspected that Spm was carried in chromosome 5 in the parent plant, many ~~a large number of~~ test crosses were conducted with the plants in cultures 6683 to 6685. The kernel types on the resulting ears p~~roduced by these testcrosses~~ confirmed ~~established~~ the assumption of the presence of two Spm elements in the parent plant, 6629B-5, each of which was located in its chromosome 5 and at positions that allowed linkage with pr to be expressed with this marker. ~~the [illegible] pr~~. By reason of the difference in constitution of this marker in ~~of~~ the male plants used in the cross to each of the 3 ears of plant 6629B-5, all plants derived from kernels on the first ear of the main stalk (plants in culture 6683), and from the ear of the tiller (plants in culture 6685) carried Pr in one chromosome 5. For the same reason, those derived from the second ear of the main stalk had pr in one chromosome 5. As stated above, plant 6629B-5 was Pr/pr. Therefore, the plants in culture 6683 and 6685 could be either Pr/Pr or Pr/pr, and those in culture 6684 could be either Pr/pr or pr/pr.

Seventeen plants ~~were~~ grown from the variegated, Sh_2 class of kernels, were tested in cultures 6683 and 6685. Sixteen of them were variegated but one that was Pr/Pr was totally pale pigmented and no evidence of Spm was given by the kernels on the testcross ear it produced. Among the 16 plants that were variegated, 4 were Pr/Pr and 12 were Pr/pr. One plant (6683A-2), derived from a uniformly palecolored kernel, was variegated and it was Pr/pr.

On the testcross ears ~~of~~ produced by 13 plants among the 35 in cultures 6683 and 6685 that were derived from colorless, sh_2 kernels, no evidence was given of the presence of Spm in any kernel. Twelve of these 13 plants were Pr/Pr and 1 was Pr/pr. ~~However,~~ An active Spm was present in 20 of these 35 plants. Four of them were Pr/Pr and 16 were Pr/pr. In the 2 remaining plants, each of which was Pr/pr, Spm was present but it was in its inactive state in most of the Spm carrying kernels on the testcross ear ~~of~~ produced by each.

The three plants in culture 6684 that were derived from variegated, Sh_2, Pr kernels on the second ear of the main stalk of plant 6629B-5, were, as expected, Pr/pr. Among the 14 examined plants derived from the colorless, sh_2 kernels on this ear, no evidence of Spm was given by any kernel on the testcross ear produced by 3 of them, each of which was Pr/pr. The other 11 plants had Spm. Two of these plants were Pr/pr and 9 were pr/pr.

From the distribution of Spm and ~~of~~ the alleles of Pr to the progeny of plant 6629B-5, it is evident that Spm was carried in the chromosome with pr in all three tested parts of this plant. Because ~~the~~ the Spm carrying progeny of plant 6629B-5 could be distributed to 11 distinct classes ~~with~~ according ~~respect~~ to the constitutions with regard to alleles of Pr and to Spm, charts were constructed to indicate the class into which each plant, or part of a plant, could be placed. For the plants in cultures 6683 and 6685, this is given in figure 3, and for the plants in culture 6684 this is given in figure 4. In table 52 is entered the kernel types appearing on the testcross ears of the Pr/Pr plants in the first three classes given in figure 3. In table 53 is given the kernel types on the test cross ears of the four classes of plants that were Pr/pr in figure 3. Because of the similarities in ratios of kernel types on each of the ears produced by plants in the first 4 classes given in figure 3, the data from all ears are entered in summary form in tables 52 and 53. The ratio of kernel types on all ears produced by plants in class 6 of figure 3 were not alike. Therefore, the phenotypes of kernels on ears produced by each plant are entered separately in table 53. On most of these ears, the percent of recombinants among the variegated class of kernels was similar, averaging about 25. ~~amounting to approximately 25.~~ A marked deviation from this was expressed by the ratio of kernel types appearing on the ear produced by the tiller of plant 6683D-2. In this plant, changes in Spm were occurring early in development as evidenced by the appearance of a sector on this ear in which all of the kernels were pale pigmented and by the fact that the Spm constitution of the tiller differed from that of the main stalk, ~~which~~ The latter was Pr + +/pr Spm Spm. The Spm in the tiller probably had been transposed to a location close to pr, as will be shown shortly. A marked difference in the percent of recombinants was also expressed on the ear of plant 6683D-3 but on this ear, t~~here was a marked deficiency i~~n the number of kernels ~~with~~ having the pr phenotype was much lower than expected.

The kernel types appearing on the testcross ears produced by the Spm carrying plants in culture 6684 are entered in table 54 according to ~~under~~ the constitution of each as shown ~~headings given~~ in figure 4. A number of testcrosses were conducted with one plant, 6684D-1, which was Pr Spm/pr +. The percent of recombinants among the variegated class of kernels on the ear of this plant, and ~~from~~ on those produced by use of the pollen of its tiller is approximately 34. The pollen derived from the main stalk of this plant had many grains in which Spm was absent, as the ratio of the pale to the variegated class of kernels on testcross ears produced by use of it indicate. Tests of the progeny of plant 6684D-1, derived both from the selfpollinated ear of the tiller and of the pollen of this tiller indicate that the Spm in its Pr chromosome could have ~~probably~~ resulted from crossing over rather than transposition. The percent recombinants appearing on the testcross ears of its Pr Spm/pr+ progeny amounted to approximately 25, as will be shown shortly.

From the above described tests of the progeny of plant 6629B-5, its constitution would appear to be Pr + +/pr ~pm Spm. Relatively little transposition of the Spm elements in it occurred during development of this plant and during development of its ~pm carrying progeny when this is compared with that which occurred in some of the plants previously discussed. On the ear of the tiller of this plant, a few kernels appeared that exhibited only one to several small dots of the A_1 type pigment in a colorless background instead of the expected pattern of many such spots usually produced by either state 5719A-1 or state 5718 of a_1^{m-1} when Spm is present. A few kernels of this type likewise appeared on ears of some of the plants in its progeny that were derived from fully variegated kernels. Tests conducted with plants derived from ~~such~~ kernels with altered variegation patterns showed that the Spm in them was behaving in a different manner. Also, one of the Spm elements in plant 6629B-5 entered the inactive phase in some cells. For this reason, some plants that were derived from the pale class of kernels on the ears of plant 6629B-5 had an Spm element in them. Return to the active phase in some cells of these plants occurred, but only very late in development. It should be stated, however, that usually, plants derived from pale kernels do not have Spm in them. The~~se~~ two types of change in Spm action just mentioned, will be considered subsequently. ~~They are~~ attention is drawn to them ~~mentioned~~ here because initial investigations of change in action of Spm were conducted with plants in the progeny of plant 6629B-5.

Progeny Test 25, figure 2

The ratio of kernel types on the ear produced by the tiller of plant 6683D-2 suggested that the Spm in it occuppied a position closer to pr than in related plants that were Pr +/pr Spm, table 53. In order to verify this, seven kernels were selected from the variegated, Pr class on the ear of the tiller and sown under culture number 6878 in the summer of 1955. The selected kernels were derived from the recombinant class on the ear. As emphasized earlier, if Spm is located close to a gene marker, the Spm-carrying recombinant class is likely to be composed mainly of individuals having a newly transposed Spm element in them. This proved to be true in this case. In 6 of the 7 tested individuals in this class, the Spm in them certainly had been transposed from a position close to pr to another location in the chromosome complement, as the kernel types on the testcross ears obtained from each indicate, table 55. In one plant, 6878A-1, Spm was carried in its chromosome 5 with Pr. The location of Spm with respect to Pr could not be estimated from the ratio of kernel types on the testcross ears it produced because of the preponderance of the pale class of kernels on each. This indicated, nevertheless, that the Spm in this plant had undergone change in a number of cells late in plant development.

In the 6 plants having Spm at a new location, no linkage of it with Wx was expressed on the testcross ears produced by any one of these plants. Neither was it linked with Y in plants 6878A-3 or 6878A-4 in which this could have been detected. The Spm in plant 6878B-3 underwent early occurring transposition, as indicated by the differences in Spm constitution in the main stalk and in the tiller of this plant.

Because at least 6 of the 7 individuals that were derived from the recombinant class in the progeny of the tiller of plant 6683D-2 had a newly transposed Spm element in it, it is concluded that the Spm in the tiller ~~of plant 6683D-2~~ was located very close to pr.

Progeny Test 26, figure 2

A similar type of test to that just described was conducted with plants derived from the variegated class ~~of~~ recombinant kernels on an ear produced by plant 6685F-3. This plant was Pr +/pr Spm, as the kernel types appearing on three of its testcross ears indicate, table 53. The location of Spm in this plant did not appear to be as close to pr as it was in the tiller of plant 6683D-2, just described. It could be anticipated, then, that a larger proportion of individuals in the recombinant class would represent cases in which crossing over between the site of insertion of Spm in chromosome 5 and the locus of pr was responsible for their appearance in this class rather than cases of transposition of it to a new location in the chromosome complement. This appears to be confirmed from tests conducted with variegated plants derived from the recombinant class on the ear of a tiller of plant 6685F-3. The kernel types that appeared on this ear are shown in line 1 of table 56. Ten variegated kernels were selected from the 21 that were ~~variegated and~~ Pr in phenotype, and sown under culture number 6882 in the summer of 1955. Spm was present in 9 of the 10 plants derived from these kernels but no evidence of its presence was given by one plant. One Spm was present in 8 of the 9 plants having ~~Spm,~~ I, ~~1 Spm was present~~ and it was linked with Pr in four of ~~these~~ 8 plants, as shown in lines 2 to 5 of table 56.

In the other four plants, Spm was not linked with Pr (lines 6 to 10, table 56) nor with Wx, which also could have been expressed on these ears. In one plant, 6882A-2, at least 4 Spm elements were present (lines 10 and 11, table 56).

The percent of recombinants among the variegated class of kernels is given in round numbers in the last column of table 56. Although difference in this on the different ears is to be expected because of transposition of Spm that certainly occurred in some cells of these plants, deviation from that expressed on the ears of the parent plant is not great enough in any one case to indicate with certainty that the location of Spm in chromosome 5 in any one of them differs from that in the parent plant. Only progeny tests of each would allow this to be determined and these were not conducted. However, the Spm element in at least 5 of the 9 plants derived from the recombinant class on the parent ear had been transposed from a location in chromosome 6 that gives linkage with pr to a new location in the chromosome complement.

Progeny Test 27, figure 2

Among the examined progeny of the tiller of plant 6629B-5 there were 3 Pr/Pr plants in which 1 Spm was present (figure 3 and table 52). Among them was plant 6685G-2. With respect to chromosome 3 constitution, this plant was a_1^{m-1} (state 5719A-1) $Sh_2/ a_1\ sh_2$. An ear of this plant had been used in a cross with a plant that was homozygous for state 5719A-1 a_1^{m-1} and for Sh_2, pr, y, and wx and in which no Spm was present. The kernel types that appeared on this ear are entered in the first line of table 57. Variegated kernels were selected from this ear and sown under culture number 6875 in ~~during~~ the summer of 1955. The 20 plants derived from them were examined for the Spm constitution in each. The pollen used in making the testcross with each was obtained from plants that were homozygous for state 5718 a_1^{m-1}, and for Sh_2, pr, y, and wx, and in which no Spm was present. The test had been devised for reasons other than to determine if Spm was located in chromosome 5 and for the desired purpose, use of pollen from the described tester stock was most suitable. Nevertheless, from these tests it was learned~~, however,~~ that the Spm in plant 6685G-2 was located in chromosome 5. With regard to a_1^{m-1} constitutions the plants in culture 6875 were of two types: homozygous for state 5719A-1 a_1^{m-1} and heterozygous for this state, with the standard a_1 being carried in one of its ~~the homologous~~ chromosomes 3. The Pr and pr phenotypes among the pale class of kernels on ears of plants that are ~~were~~ homozygous for state 5719A-1 may ~~could~~ be distinguished readily. However, on the ears produced by the heterozygous plants, only half of the kernels would have state 5719A-1 a_1^{m-1} in them. The other half would receive a_1 from the female parent and state 5718 a_1^{m-1} from the male parent. Kernels having state 5718 a_1^{m-1} and no Spm are only very faintly pigmented. Distinction between those that are purple (Pr) and those that are red (pr) is made only with considerable effort and this was not attempted in classifying the kernel types on ears produced by plants in culture 6875 that were a_1^{m-1}/a_1 in constitution. For this reason, all kernels in the pale classes on the testcross ears of plants of this constitution are entered in table 57 under the heading "Pale", no distinctions being made between those that were Pr and those that were pr.

Spm in its active state was present in 17 of the 20 tested plants in culture 6875. In three plants, however, although Spm was present, it was totally inactive in most parts of each plant and in most of the kernels having it on the ear each plant produced. One Spm was present in all tested parts of 15 of the 17 plants having an active Spm and it was carried in the chromosome 5 with Pr in 14 of them, as the kernel types on the ears each produced indicate, table 57. The single Spm in one plant was not linked with Pr (Plant B-8, table 57). In two plants, 2 Spm elements were present, one of which was linked with Pr, Plant B-9, and ear on main stalk of plant B-7. However, the tiller of plant 6875B-7 had only 1 Spm and it was linked with Pr.

In this progeny test, no selection of kernel types was made for the purpose of determining the ~~any~~ location or the constitution of Spm in the plants. From the fact that the large proportion of ~~progeny~~ plants in this progeny carried Spm in chromosome 5 and at a location that gave ~~clear~~

clear evidence of linkage of it with Pr, it may be concluded that the Spm in the parent plant did not undergo frequent transposition during development.

<u>Progeny Test 28, figure 2</u>

Tests of the three plants in culture 6684 that were derived from the recombinant class of variegated kernels on the second ear of the main stalk of plant 6629B-5 showed that plant 6684D-1 was Pr Spm/pr + in constitution (figure 4 and table 54). A number of testcrosses were conducted with this plant, including use of its pollen for this purpose. Pollen from its tiller had been placed on the silks of plants that were homozygous for state 5719A-1 a_1^{m-1} and for pr and in which no Spm was present, and also on the silks of ears of some plants that were homozygous for a_1 and for pr and in which no Spm was present. Variegated kernels in the Pr class were selected from an ear produced by the former type of cross and grown under culture number 6880, and selection of kernels of a similar type from an ear produced by the latter cross were sown under culture number 6881. Among the 11 plants in culture 6880, 10 were variegated but one plant was uniformly pale pigmented and no evidence of the presence of Spm in it was given by kernels on its testcross ear. All 10 plants in culture 6881 were variegated. An ear of each plant was used in a cross with a plant homozygous for state 5719A-1 a_1^{m-1} and for Sh_2, pr, y and wx and in which no Spm was present. ~~xxx~~ The phenotype in each kernel on the ears of ~~these~~ plants in culture 6880 was readily classif~~y~~able. However, difficulty was encountered in separating some of the kernels that were pr from those that were Pr in the pale class on the ears of some of the plants in culture 6881. This was because of a previously undetected mutant locus that was segregating in the a_1/a_1 plant~~s~~ used in making the cross with plant 6684D-1. When present, this mutant alters the pigment produced in the pale class of kernels that are homozygous for pr from a light pink to a lavendar shade that is sometimes quite intense. This mutant does not alter the phenotypic expression of A_1. The A_1 dots in the variegated kernels that are homozygous for pr are deep red when this mutant is present. Therefore, in considering the phenotypes of kernels on the testcross ears of plant in culture 6881, given in table 58, all of those in the pale class are combined under the heading "Pale".

Of the 20 plants in cultures 6880 and 6881 that had Spm, one Spm element~~s~~ was present in 19 of them and its was carried in the chromosome 5 having Pr in 17 of these 19 plants, as shown in table 58. In one plant 3 Spm elements were present (plant 6881-5, table 58). In the last column of table 58 is given the percent of kernels among those that were variegated that were in the recombinant class on ears of ~~for~~ the 17 plants in which Spm was linked with Pr. Although a considerable amount of variation in this was expressed on different ears, the average percent is greater than that expressed in the progeny of plant 6685G-2 (table 57), suggesting that the location of Spm in chromosome 5 in plant 6684D-1 was not the same as that in plant 6685G-2.

In the progeny derived from use of the pollen of the tiller of plant 6684D-1 there were 3 plants in which transposition of Spm had occurred. In two of them, 1 Spm was present and it was not linked with Pr in either plant. In the third plant, at least 3 Spm elements were present. The appearance of plant with more than 2 Spm elements in them in the progeny of plants having only 1 Spm has been met with on a number of occasions, and examples of this were noted in the progeny tests entered in tables 42, 45, 47, 49 and 56.

Tests of the progeny of plant 6684D-1 were also conducted with plants derived from the variegated Pr class of kernels ~~that appeared~~ on the ear of the tiller. This ear was produced by self-pollination. The phenotypes of the kernels that appeared on this ear are entered in the first line of table 59. Of the 16 plants in the progeny derived

derived from this ear, 15 carried Spm in them but in one plant, no evidence was given of the presence in it of Spm. Eleven of the 15 plants having Spm were Pr/pr. In 9 of these 11 plants, one Spm was present and it was carried in the chromosome with Pr in 5 of them (plants under heading Pr Spm/pr + in table 59). It was present in the chromosome with pr in ~~the~~ other two plants (plants under heading Pr+/pr Spm table 59), but in the remaining two plants, no evidence was given of its being carried in chromosome 5. The two other plants that were Pr/pr (plants 6879-11 and 6879-19) may have had an Spm element in each chromosome 5. Of the four plants that were Pr/Pr, two had 1 Spm element (plants 6879-6 and 6879-12, table 59) and the two others may have had an Spm element in each chromosome 5 (plants 6879-1 and 6879-14, table 59) although the ratio of kernel types appearing on the ear of plant 6879-14 suggests that it had two Spm elements that were not at allelic positions in an homologous pair of chromosomes.

The percent of recombinants among the variegated class of kernels on ears of plants in which Spm was carried in chromosome 5 is given in round numbers in the last column of table 59. The average of this is similar to that given by plant 6684D-1 (table 54) and is higher than that expressed by the progeny of this plant entered in table 58.