6. Close linkage of su_1 with a mutable locus.

Studies of an unstable chlorophyll character designated mutable luteus ($\underline{l}^m$)* are in progress. Crosses of $\underline{l}^m$ x TB4-a had indicated that $\underline{l}^m$ was located in 4S distal to the break.

A preliminary analysis of F_2 linkage data showed very close linkage between the $\underline{l}^m$ and $\underline{su}_1$ loci.

Summary table of F_2 linkage data: $\frac{Su_1 l^m}{su_1 L}$

Family	Phenotypic classification of F_2 progeny			
	Su_1L	Su_1l^m	su_1L	su_1l^m
58 046	1357	271	537	0
58 047	2247	478	815	0
58 048	3013	597	1234	0
58 049	3986	1173	1696	1
58 058	340	95	134	0
58 066	210	58	82	0
58 072	301	59	113	0
58 073	566	70	203	0
Total	12,020	2,801	4,814	1

19,6

There has been no indication of differential transmission of gametes carrying $\underline{l}^m$. The reversion of $\underline{l}^m$ to $\underline{L}$ has been estimated to be about nine per cent in the female. It appears to be somewhat higher than this in the male.

The above data was not adjusted for estimated rate of reversion.

*($\underline{l}^m$ previously reported by Rhoades and Dempsey - MCNL24)

J. D. Smith

Present address: Texas A. and M., College Station, Texas

INSTITUTE OF GENETICS
University of Lund
Lund, Sweden

1. Compound structure of the kinetochore in maize.

For our understanding of the organization of the chromosome at both the cytological and genetic levels it is necessary to know the structure and function of its components. The kinetochore is one of the chromosome's most important segments, not only because it leads the chromosome in its movements, but also because it shapes the pattern of the arms, interacts with other segments and influences the

distribution of most chromosome properties.

Although excellent preparations of maize pachytene chromosomes may be readily obtained, cytologists and cytogeneticists who have studied them for the last 20-30 years have described the kinetochore in this organism as an empty region and represented it in drawings by a large circle.

This was most unfortunate since this classical organism together with Drosophila contributed to establish most of our cytological and genetic concepts. The result has been that we have looked for many years at the kinetochore as an empty region deprived of structure and subsequently of genes or any specific activity.

In the last ten years our study of the kinetochore structure in other organisms has radically changed this picture (Lima-de-Faria, Int. Rev. Cyt., 1958). But the maize chromosomes remained as a kind of exception to the now well established occurrence of a complex structure within the kinetochore.

During a study of pachytene chromosomes of maize carried out at the University of Illinois, the kinetochore of pachytene chromosomes was investigated by means of the squash technique commonly used for this organism. Anthers were fixed in propionic acid - 95% alcohol 1:3 and stored in a freezer. The P.M.C.'s were stained with aceto-carmine as in the usual procedure.

In many cells the kinetochore of pachytene chromosomes of corn exhibited with sharp clearness a quite complex structure. In maize, due to the existence of the chromomere size gradient on both sides of the kinetochore, this organelle can be very well delimited.

The kinetochore appears to be composed of chromomeres and fibrils indistinguishable in stainability and morphology from those found in other regions of the chromosome. As a rule one or two chromomere pairs are seen in each kinetochore but as many as three chromomere pairs separated by weakly stained fibrils may be observed.

The pattern is essentially the same as found in rye, Agapanthus and other organisms (Lima-de-Faria, Hereditas, 1949 and Chromosoma, 1955). Within the kinetochore of maize chromosomes there can be found as many as 7 different segments: 3 chromomeres and 4 fibrils. This reveals that the structure is sufficiently complex to permit the occurrence of rearrangements leading to the formation of kinetochores with different genetic constitutions.

A functional differentiation among kinetochores of the chromosomes of maize was found by Gurgel (MNL, 1956 and X Int. Cong. Genet., 1958). At pachytene, kinetochores of nonhomologous chromosomes may associate as the kinetochores of salivary gland chromosomes of Drosophila regularly do. This association in maize is less intimate than in Drosophila

and it occurs sporadically. Of special significance is that Gurgel made a statistical analysis of the frequency of association and found that all kinetochores associated at random except the one of chromosome 5. The frequency of association was much higher for this chromosome.

This result can now be better interpreted as the compound kinetochore structure here described can be easily conceived to mutate or rearrange, leading to the formation of kinetochores with different properties.

McClintock (Genetics, 1938) has shown that chromosome 5 could be fragmented through the middle of its kinetochore, the two halves retaining their functional activity on the spindle. The functioning of one half and the structural similarity of the segments reveal that the kinetochore of maize is a repeat. The kinetochore of rye is also a functional repeat, since a kinetochore with one chromomere and two fibrils (with about one third of its elements) functions normally on the spindle, being perpetuated through mitosis and meiosis (Lima-de-Faria, Chromosoma, 1955), and further each half of the kinetochore forms a separate iso-chromosome (Lima-de-Faria, Hereditas, 1956).

When the nucleolar organizer of maize chromosomes is split into two segments both retain their functional activity, but the large proximal segment of the nucleolar organizer forms a smaller nucleolus than the small distal segment (McClintock, Z. Zellf. u. Mikr. Anat., 1934). Similarly, a kinetochore with a deletion shows higher ability to withstand elimination at meiosis and less power to influence the pattern of the arms (Lima-de-Faria, Chromosoma, 1955). The elements of both the kinetochore and the nucleolar organizer have the same essenti properties but they differ from each other in their functional power.

A. Lima-De-Faria

2. Viability of translocated chromosomes in maize.

In the study of chromosome organization it is relevant to know whether chromosomes with new arrangements are more or less viable than those with the normal pattern. With this in view a cross was made using pollen of plants heterozygous for translocation 5-6 (T 5-6 y/N Y) and female plants carrying small y. Translocated chromosomes carry small y (white kernels) and normal chromosomes large Y (yellow kernels). The results are summarized in Table 1.

The differential fertilization of gametophytes carrying Y and y is highly significant. Gametophytes carrying translocated chromosomes are apparently more viable than those with normal chromosomes.

In this translocation the nucleolus organizer is moved to the end of a long arm after a knob, quite far away from the kinetochore. In