Even though we are reporting limited data (28 cells), certain relationships are seen to emerge: Chromosomes 1, 3, 4 and the B chromosome appear to possess the most negative coefficients. Additional data from this study suggest that the B chromosome is delayed beyond mid-S in initiating uptake of label. Further, the data suggest that the terms late and early replication are ambiguous when used to describe the replication of chromosomes. The terms indicate the time within the S period at which a chromosome begins replication, but are not necessarily descriptive of the rate or mode of replication once DNA synthesis has been initiated within a chromosome.

Differences in coefficients can be tested by appropriate tests. Large standard errors, such as the one associated with chromosome 5, may indicate curvilinear as well as linear relationships. Regression analysis was possible only because of our ability to identify the somatic chromosomes in maize, and is unique in that it quantifies the patterns of replication of specific chromosomes and allows quantitative comparisons of these patterns. We are employing cytogenetic modifications of specific chromosomes in an attempt to alter the replication patterns. In addition, we can determine gross alternatives of replication patterns in chromosome segments.

G. R. Douglas

4. An abnormal chromosome 6 in maize.

One stock of maize was found having two secondary constrictions located in the distal portion of the short arm of chromosome 6 at somatic metaphase. Two tandem satellites were observed on each homologue (Fig. 1d). If in the normal stocks the secondary constriction at somatic metaphase corresponds to the heteropycnotic nucleolar organizer at pachynema, the stock described here may have two nucleolar organizers on chromosome 6. The following observations from meiosis and mitosis seem to suggest that this abnormal chromosome may have originated from a normal 6 through a paracentric inversion with one breakpoint in the nucleolar organizer and the other proximal to the organizer (Fig. 1). To conform with maize terminology, we have assigned "A6" to this abnormal no. 6 chromosome.

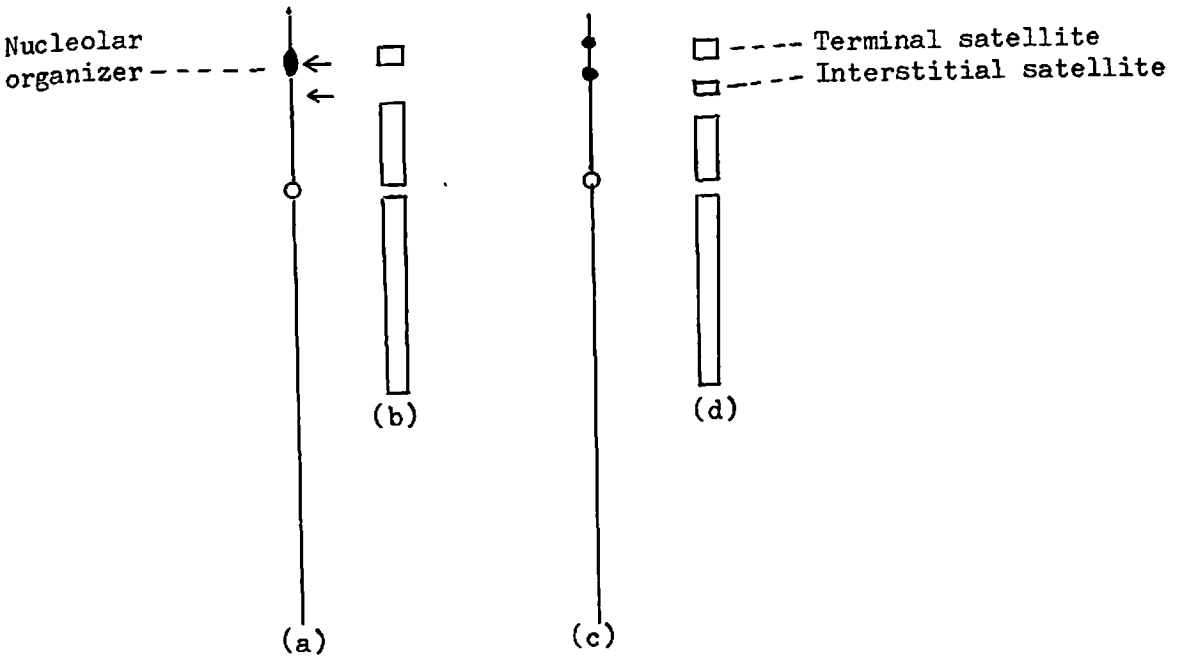

Figure 1. Diagram of the normal and abnormal chromosome 6 at pachynema and somatic metaphase.

(a) Normal chromosome 6 at pachynema, arrows indicate breakpoints.
(b) Normal chromosome 6 at somatic metaphase.
(c) Abnormal chromosome 6 at pachynema.
(d) Abnormal chromosome 6 at somatic metaphase.

1. Bridges and fragments were found infrequently at anaphase I in the microsporocytes of two heterozygous plants (N6/A6). Since a bridge and fragment could result from a crossover event occurring in the inverted segment, the observation of a loop at pachynema should provide direct cytological evidence for the paracentric inversion hypothesis. However, no such configuration was seen, probably because the inverted segment is too small to permit detection of a loop. We did observe some abnormalities such as two heteropycnotic regions, two nucleoli (usually one large and one small), and loose pairing of the segment distal to the nucleolar organizer region in the microsporocytes of both the homo- and heterozygous abnormal 6 plants.

2. The normal and the abnormal chromosome 6 in the somatic metaphase cells of heterozygous plants were measured and compared. The results from measurements of 44 cells are presented in Table 1. The

Table 1

Measurements of N6 and A6 chromosomes from 44 somatic metaphase cells

	Normal chromosome 6			Abnormal chromosome 6				
	Long arm	Short arm	Satellite	Long arm	Short arm	Interstitial satellite	Short arm + Int. sat.	Terminal satellite
Mean length (u)	2.68	1.39	0.54	2.60	1.03	0.40	1.43	0.49
S.E. of mean	0.051	0.024	0.019	0.053	0.024	0.021	0.032	0.018

Table 2

Transmission of the abnormal chromosome 6

Cross	Chromosome constitution in the progeny			X^2 value for 1:1 or 1:2:1 ratio
	N6/N6	N6/A6	A6/A6	
N6/A6 ♀ x N6/N6 ♂	27	27		0
N6/A6 ♀ x A6/A6 ♂		28	26	0.07
N6/N6 ♀ x N6/A6 ♂	25	44		5.23*
N6/A6 ⊗	26	62	49	9.39**

*Significant

**Highly significant

difference between the components of the normal 6 and the corresponding components of the abnormal 6 was tested by means of *t* test. There was no significant difference between the length of the satellite of the normal 6 and that of the terminal satellite of the abnormal 6 (t = 1.7452, d.f. = 43). The short arm of the normal 6 is apparently longer than the short arm of the abnormal 6 (t = 11.0689, d.f. = 43). However, when the interstitial satellite was taken as one part of the short arm of the abnormal 6, the difference between the short arm of the normal 6 and that of the abnormal 6 was not significant (t = 1.7999, d.f. = 43).

To study the transmission of abnormal 6, heterozygous plants were self-pollinated and backcrossed to N6/N6 and A6/A6 plants. The results from the crosses are shown in Table 2. The abnormal 6 was transmitted more frequently than the normal through the male gametes. It seems that the pollen grains with one, non-crossover, paracentric inversion on chromosome 6 may have selective advantages over the normal pollen grains (without A6) in germination and tube growth. Therefore, A6 will spread throughout the stock after several generations of self-pollination and/or sib-crossing.

C. C. Chen

5. Abnormal recovery of parental classes in the heterozygous translocation 9 - 2c.

A series of translocation stocks, all involving the short arm of chromosome 9, was obtained from the Maize Co-Op for mitotic studies. Meiotic and recombinational data were taken on a majority of the stocks. The stock in question, 9 - 2 c (9s.33 - 2s.49), T + + +/N wx bz_1 sh_1, was backcrossed to the chromosome 9 tester. The data in Table 1 demonstrate (a) no recovery of crossover events between sh_1 - bz_1; (b) a marked reduction in crossing-over between bz_1 - wx; and (c) an abnormal ratio for the two parental classes (+ + + and wx bz_1 sh_1) from both the ♂ and ♀ T/N parents.

A comparison of crossing-over in the bz_1 - wx region through the ♂ and ♀ (using X^2 and Maximum Likelihood variance estimates) showed no significant difference at the 5% level. Homogeneity tests within the o and o populations (cob to cob) showed no significance at the 5% level.