Case, M.E. and N. H. Giles. The problem of mitotic recombination in Neurospora.

There is evidence that mitotic recombination (or reassortment) occurs in certain ascomycetes. One such case has been reported in Neurospora utilizing unlinked markers (Weir, J.A., Genetics 45:1016, 1960). This phenomenon has been considered as one possible explanation for interallelic complementation and also for atypical segregations in asci.

Preliminary evidence bearing on this question was obtained from platings of unisexual and bisexual heterocaryons utilizing unlinked biochemical mutant markers. These results produced no evidence for nuclear fusion followed by chromosomal reassortment such as to give rise to new genotypes, which would be capable of growing on an unsupplemented medium.

Following the previously mentioned report of mitotic reassortment in Neurospora, this problem has been investigated further by making the following cross and looking for prototrophs on an adenine supplemented medium. This cross involves three of the seven linkage groups in Neurospora. The protoperithecial parent, hist-2 pan-2 ylo A was crossed utilizing conidia from a heterocaryon hist-2 a + ad-6 pan-2 ylo a. The hist-2 and pan-2 markers are the same mutants in both the protoperithecial and heterocaryon parental strains. The ad-6 mutant is not linked to these mutants, while ylo is linked to pan-2. In this manner, fertilization of the protoperithecial parent nuclei by either one of the two parental nuclei in the heterocaryon would constitute a selfing with respect to either the hist-2 or the pan-2 locus and no prototrophs would be expected to occur when the cross is plated on an adenine-supplemented medium (Diagram A).

Diagram A

Protoperithecial parent	X	Heterocaryon parent		
A, hist-2		a, hist-2		a, hist-2+
ylo, pan-2		ylo+, pan-2+	+	ylo, pan-2
ad-6+		ad-6+		ad-6

If however, mitotic reassortment has occurred at some point during either the formation or growth of the heterocaryon, or as a result of a triple fusion and reassortment at the time of fertilization, then prototrophs would be recovered in such a plating (Diagram B).

Diagram B

Protoperithecial parent X the reassorted parents 1 or 2

1	a, hist-2+	2	a, hist-2+
	ad-6		ad-6+
	ylo+, pan-2+		ylo+, pan-2+
	This prototroph would require adenine.		This prototroph would not require adenine.

Furthermore, it should be noted that the pan-2 parent is stable and incapable of reverse mutation, and in addition that neither parent gives rise to prototrophs in selfings. At the present time, utilizing the heterocaryon as the conidial parent, 9.4×10^6 viable ascospores have been plated from this cross and no prototrophs have been recovered. The results of this type of test thus give no evidence for mitotic reassortment in Neurospora. ---Biology Department, Yale University, New Haven, Connecticut.