3. Random self-fertilization in a finite population of autotetraploids.

Wright (1938)* has derived the formula for determining F, the coefficient of inbreeding, for a finite population of monoecious autopolyploid individuals with random self-fertilization. In working with autotetraploid maize, the need arose to extend his formula to take into consideration alpha, the coefficient of double reduction. Double reduction does occur in autotetraploid maize, and therefore would contribute to inbreeding. The inclusion of alpha, double reduction, leads to the formula,

$$P_n = \frac{1}{6N} \left\{ (8N - 3 - 2N\alpha) P_{n-1} - (1 - \alpha)(2N - 2) P_{n-2} \right\}$$

where P is the panmictic index and is equal to 1 - F, N is the number of monoecious autotetraploid individuals, and n is the generation. When alpha equals zero, the above expression reduces to Wright's formula,

$$P_n = \frac{1}{6N} \left\{ (8N - 3) P_{n-1} - (2N - 2) P_{n-2} \right\}$$

If N equals one, complete self fertilization occurs.

C. S. Levings III

*Wright, S. The Distribution of Gene Frequencies in Populations of Polyploids, P.N.A.S. 24:372-377. 1938.

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Proposal: It is proposed that a collection of digital computer programs of value to practicing maize geneticists be started and maintained. Such a collection might encompass programs suitable for:

1. field notebook production, and plot arrangement and layout
2. statistical reduction of plot data
3. useful data manipulative procedures for geneticists (both common and somewhat uncommon).

The Computer Center, Ohio University volunteers to be the repository and distributive center for this, if desired. It should be noted, however, that a strong research effort in maize genetics is not extant here.

It is suggested that programs submitted to such a repository should be freely available for distribution and that the repository agency cannot be responsible for accuracy or correctness of the programs or algorithms. It is further suggested that only 'higher level' languages such as FORTRAN, ALGOL, or PL/1 be accepted.

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1. Analysis of factors controlling chiasmata in maize.

Evidence regarding the genotypic control of chiasmata in maize is provided by (1) differences between inbred lines and (2) the greater genetic rather than the environmental (error) component of variance (Rao, 1966: M.S. Thesis, Orissa University of Agriculture & Technology, Bhubaneswar, India). The genotypic control appears to be exerted by a polygenic system besides the few known major genes. Environment is divisible into at least two major components: (1) general or external environment comprising factors like temperature, nutrition, etc. and (2) special or internal environment to which meiocytes are directly exposed inside the plant body. While appreciable information is available on the action of the first component, much less is known about the contribution, if any, of the second component. One approach to this problem of the internal environment appeared to be offered by the observed asynchrony of PMC division in many lines of maize (Rao, 1966). For example, within individual anthers one could find (1) about half of the PMC's in pachynema-diplonema or earlier stages and half at diakinesis, (2) cells mostly in diakinesis, (3) half in diakinesis and the rest in later stages. In case the groups of anthers provided different extra-cellular environment for the PMC's at diakinesis, any difference in chiasma frequency should lend information about the role of the internal component, i.e. inter-cellular influences. The study undertaken with this objective appeared to reveal the operation of at least two further components of the 'internal environment': one temporal and related to the onset or progress of the stage of division, the other spatial due partly to interaction with the neighboring cells.

Eight inbred lines and three single crosses were taken for the present study. The total number of anthers examined from each line is indicated in Table 1. Chiasma frequency of PMC's at diakinesis was noted in acetocarmine squash preparations. Anthers were grouped into three classes according to the frequency of division stages: (1) about 1:1, diakinesis: early stages, (2) mostly diakinesis, and (3) about 1:1, diakinesis: late stages. For convenience these will be referred to as Groups 1, 2 and 3, respectively.

From the data presented in Table 1, a regular trend may be noted in all inbreds except one (Ext 127). In these there is a decreasing order of