RESEARCH METHODS

Construction and maintenance of stocks

Note by editors The material by H. J. Muller for the following sections was prepared in the form of pictorial diagrams on large wall charts, and was thus exhibited by him at the Sixth International Congress of Genetics at Ithaca in 1932. Photographs of these charts were supplied by Muller as the material for the following accounts. In order to reduce the charts to forms suitable for reproduction by typewriting on stencils, the editors have transcribed them, with as few as possible changes in the basic plan of each chart. With respect to details, they have made minor changes, to wit:- (1) recasting the nomenclature current in 1932 into that of 1935, (2) employing "f" as the marker for a "foreign" chromosome to be introduced into a given "homozygous" or "host" stock, which is marked by "h", and (3) substituting Pm for S, and cy^D for cy, as markers. (Star can not easily be told in flies with other eye shapes, while Plum is excellent; the use of cy left the emergent stock encumbered with this character, while the use of dominant markers (cy^D and ci^D, available since 1932) for chromosome 4 gives a clean stock.

Muller, H. J. Construction of Homozygous Stocks.
(See also similar technique by Bridges, Carn. Inst. Wash. Yr. Bk. 28:338, 1929.)

P_1 φ^h = donor for desired homozygote (or donor may be σ; if so, mate to $\underline{Y}$;Pm/$\neq$;H/$\neq$ φ)

X

Pm/$\neq$;H/$\neq$ $\sigma\sigma$ (Dominant markers in 2 and 3 may be replaced by T(2-3) with one dominant marker).

F_1 one σ 1^h;Pm/2^h;H/3^h (save for remating!) X $\underline{Cl}B/\neq$;Cy/$\neq$;CC,D/$\neq$ $\varphi\varphi$ (different dominant markers)

F_2 Father (remated) X $\underline{Cl}B/1^h$;Cy/2^h;CC,D/3^h $\varphi\varphi$ (crossing-over prevented)

F_3 $1^h;2^h;3^h$ completely homozygous $\varphi\varphi$ X $\sigma\sigma$

For controlling 4 also, the 4th chromosome dominant cy^D may be used together with Pm/$\neq$;H/$\neq$ (or with $\underline{Y}$;Pm/$\neq$;H/$\neq$), and ci^D with $\underline{Cl}B/\neq$;Cy/$\neq$;CC,D/$\neq$. For controlling Y also, mate donor σ to $\underline{Cl}B/\neq$;Pm/$\neq$;H/$\neq$;cy^D/$\neq$ φ; save donor σ and remate to $\underline{Cl}B/1^h$; Pm/2^h;H/3^h;cy^D/4^h daughter; use one son (1^hY^h;Pm/2^h;H/3^h;cy^D/4^h) to mate to $\underline{Cl}B/\neq$;Cy/$\neq$;CC,D/$\neq$;ci^D/$\neq\varphi\varphi$; save him and proceed as above for F_2 and F_3.

F_3 yields also all possible combinations of chromosomes of P_1 donor, homo- and heterozygously, and distinguishable by markers, for analysis of contributions of all the chromosomes (whether recessive or dominant) to multiple factor effects, and for tracing sources of variability. F_3 reveals also all recessive lethal and visible mutant genes of P_1.

Chromosomes of desired "h" stock need not carry any visible mutant.