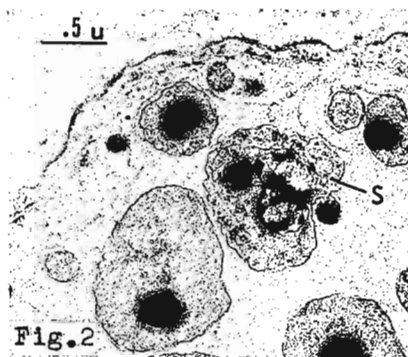
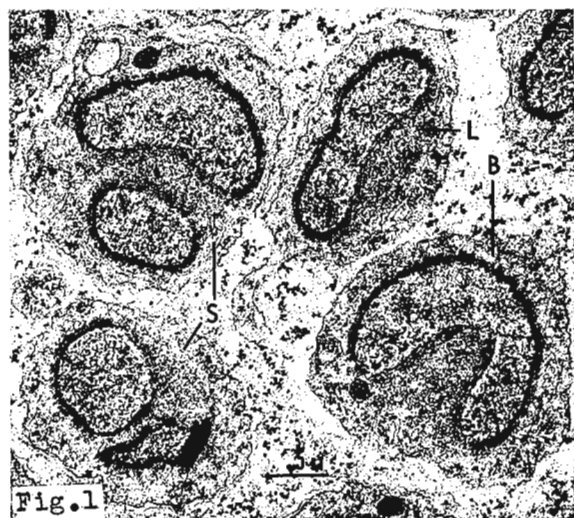


Hardy, R.W. University of California, San Diego; La Jolla, California.
Aberrant cytodifferentiation of aneuploid spermatids in *D. melanogaster*.

Herskowitz and Muller (Genetics 39:836-850, 1954) reported results which are consistent with the hypothesis that there is a morphological difference between hypo- and hyperploid sperm. They used a camera lucida to measure the lengths of heads of sperm from the seminal vesicles of

flies that had either attached XY or free X and Y chromosomes. The attached XY stock is expected to produce in each bundle 32 spermatids that contain both the X and Y and 32 that have no sex chromosome. The ratio of the amount of chromatin in the two types of nuclei, based on the size of ganglion metaphase chromosomes, is between 6:4 and 7:4. Their results showed a unimodal distribution of head lengths similar to that found in Oregon-R males except that the dispersion was greater in the attached XY stock. They interpreted the data as indicating that all the sperm heads probably have the same shape but they are distributed around two modes of lengths related as $3^3 : 3^2$. The width of the mature sperm head is less than 0.4μ and tapers to less than 0.1μ toward the acrosome (Bairati and Perotti, Comparative Spermatology, Academic Press, pp 333-346, 1970). Hence, an exact measurement of nuclear length as well as other nuclear dimensions is unlikely as these distances are below the resolution of usual light microscopy. The failure of Herskowitz and Muller to find a bimodal distribution of sperm lengths may therefore have been a consequence of the method used.

Recently, testes from flies that produce aneuploid sperm were prepared for electron microscopy by the method of Tokuyasu, Peacock and Hardy (Z. Zellforsch. 124:479-506, 1972). Electron micrographs of cross sections through the testes show that there are differences in spermatid dimensions. In $Y^{SX} \cdot Y^L$, $In(1)EN$, y B/O flies there are approximately equal numbers of nuclei of two different sizes (Fig. 1, B and L) in all bundles of early (uncondensed chromatin) pre-individualization (Tokuyasu, Peacock and Hardy, Z. Zellforsch. 124:479-506, 1972) spermatids observed. Sequential sectioning of two bundles in one testis confirmed that the difference in size is continuous along the lengths of the nuclei. The lengths of the



nuclei at this stage are comparable. Longitudinal sections of such nuclei have not been obtained, hence the exact measurement of nuclear lengths remains a question. These data do, however, suggest that dimensions of the spermatid nucleus other than length are affected by the addition or removal of chromosomes. The time during spermiogenesis at which the size difference first becomes apparent is not yet known.

In addition to the size bimodality, other deviations from normal morphology are seen at various levels along the bundles. Some nuclei are divided longitudinally into two unequal parts (Fig. 1, S). The division may be complete or incomplete. By this I mean that some nuclei are split in two from the acrosome end to the axoneme end whereas other nuclei are split only at the acrosome end giving a "forked" morphology. One nucleus was found which appears to be folded back on itself forming a hairpin configuration. By following a particular nucleus at all levels, it can be shown that this phenomenon occurs among the larger nuclei. A preliminary investigation of the occurrence of nuclei of this type in late (condensing chromatin) pre-individualization spermatids suggests that they may not complete spermiogenesis.

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Ranganath, H.A. and N.B. Krishnamurthy.
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India. Rate of development and fecundity
in *Drosophila nasuta*.

Natural selection is the result of at least three component processes - differential survival, differential mating success and differential fecundity (Ayala 1970). Differential survival at different densities during preadult stages has been shown in *D. nasuta* (Ranganath

and Krishnamurthy 1972). The experiment was conducted at 4 different densities - 200, 100, 50 and 25 eggs per vial (A, B, C and D groups respectively). To estimate the fecundity, the flies that emerged on the first day (Fast) and those that emerged on the last day (Slow) were selected. Virgins were isolated, aged for 5 days and then pair matings were made. The number of eggs laid were noted for the following 10 days. The fecundity test (Table 1) has shown

Table 1. Summary of the χ^2 homogeneity test for the fecundity of Fast and Slow developing flies.

Group	No. of Pairs	Observed	Expected	χ^2	P value
A	Fast 4	390	318.28	36.9	0.0001
	Slow 3	167	238.72		
B	Fast 6	697	480.60	243.5	0.0001
	Slow 4	104	320.40		
C	Fast 4	441	336.50	65.4	0.0001
	Slow 4	232	336.50		
D	Fast 6	798	478.80	432.0	0.0001
	Slow 4	-	219.20		

that the fast emerging flies are more fecund than the slow ones. The average number of eggs laid by fast individuals in the A, B, C and D groups are 97, 116, 110 and 133 respectively, while the corresponding slow emerging flies have 55, 26, 58 and none respectively.

The characters of organisms are an outcome of the combined effects of its genetic constitution and the process of development. The egg laying capacity varies significantly between the fast flies of the 4 groups and also those of slow flies. This is indicative of the effect of different crowdings during development on the fecundity of adult flies.

Fast developing individuals having shorter generation time with a greater average reproductive output are the positive contributors to the process of adaptation at the population level.

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References: Ayala, F.J. 1970, Essays in Evolution and Genetics in Honor of Th. Dobzhansky. Ed. M.K. Hecht & W.C. Steere, 121-158; Ranganath, H.A. and N.B. Krishnamurthy 1972, DIS 48:132.

(Continued from preceding page)

genesis (Fig. 2, S). If these spermatids do not mature and participate in fertilization the number of F_1 females would be less than the number of F_1 males. Such a deficiency of progeny from XY-bearing sperm relative to nullo-XY sperm is commonly observed in crosses of XY/O males. Males from the attached XY stocks studied with the electron microscope also yield this altered sex ratio. In a cross of the $Y^{SX}.Y^L$, In(1)EN, y B/O males to Canton-S females the fraction of Bar F_1 females was .409 (790/1929). The relation between abnormal nuclei and sperm function is being investigated.

The phenomena have also been seen in flies of the following genotypes: (1) C(2L)RM, dp; C(2R)RM, px (2) C(3L)RM, se h rs²; C(3R)RM, sbd gl e^S (3) y²/B^SY; C(2L)RM, dp; C(2R)RM, px, C(3L)RM, h²; C(3R)RM, + (4) mei-S332.

The nuclear profiles observed in these stocks have more variation than the attached XY stock. This is explicable if the kinds of aneuploidy that can occur in each stock are taken into consideration. For instance in stock (1) there are four kinds of nuclei that could occur: 1/4 no 2, 1/2 either 2L or 2R and 1/4 both 2L and 2R.

These preliminary results suggest that head size during spermiogenesis depends on chromatin content and that there are constraints on the physical amount of genetic material that a spermatid nucleus can contain and undergo normal cytodifferentiation. An analysis of nuclei in various stages of spermiogenesis is now in progress.