

4. What is necessary to demonstrate that a hereditary difference depends on a transmissible property of the cytoplasm rather than of the nucleus? Cite several cases in which breeding experiments at first suggest extra-nuclear heredity but which have ultimately been proved to be nuclear.
5. What can be said of the relative importance of nuclear and extra-nuclear heredity for differences within and between taxonomically distinct population. Give examples.
6. Discuss briefly the problem of the relationships among the phenomena of heredity, growth and tissue differentiation in the light of pertinent genetic evidence.
7. Dunn, Chesley and others have studied a gene of the mouse (brachyury) which as first described seemed to have as its only effect a shortening of the tail. By what mechanism can this gene have such a narrowly localized effect, although presumably present in all cells in the body?

1. (a) Are the genes discrete entities, physically and physiologically? What alternatives are there? Discuss briefly evidence bearing on these questions.

(b) What is the order of size of a gene from current estimates?

(c) How many genes are there estimated to be in *Drosophila*? $5 \times 10^4 - 10^5$

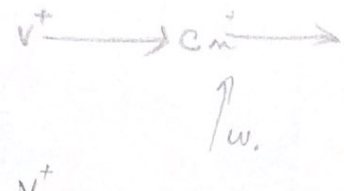
2. What were the principal results obtained by Irwin and associates on the genetics of immunological differences of red blood corpuscles among species of pigeons and doves? Discuss briefly the implications for physiological genetics.

3. Give a possible simple physiological interpretation of the following data from experiments with *Drosophila melanogaster*.

The recessives white (w), vermilion (v), cinnabar (cn), scarlet (st) and brown (bn) are due to mutations at different loci. But vv, cncn, stst and the double recessives vvcncn, vvstst, cncnstst are all indistinguishable in appearance. The double recessives vvbnn, cncbnn and ststbnn are all white eyed (or nearly so). Transplantation experiments have given the following results (using single ~~letter~~ ^{symbol} for recessives)

dw

graft	host	+	w	v	cn	st	bn
+	+	+	+	+	+	+	+
w	w	w	w	w	w	w	w
v	+	+	v	+	+	+	+
cn	+	+	cn	cn	+	+	+
st	st	st	st	st	st	st	st
bn	bn	bn	bn	bn	bn	bn	bn



lymph eye use eye radius
autonomy