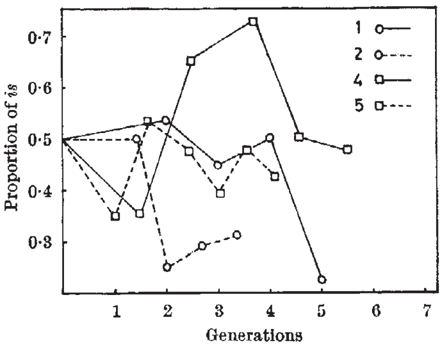

Fig. 1. Gene frequency changes during the initial stage of Exps. Nos. 1 and 2, 4 and 5

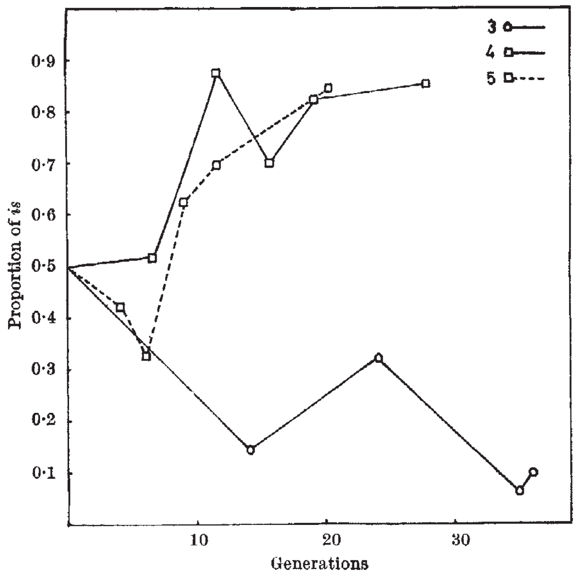

Fig. 2. Long-term gene frequency changes in Exps. Nos. 3, 4 and 5

period are due to an unequal distribution of the background genotype in relation to the alleles studied, and has little bearing on the adaptive values of these. The only definite trend to be seen is a decrease in the frequency of *is* in Exps. Nos. 1 and 2. This decrease is found again in Exp. No. 3, which was not studied during the earlier generations, but was kept going for more than 30 generations. It is shown in Fig. 2, together with the long-term progress of Exps. Nos. 4 and 5. A profound difference is found between the situation in Exp. No. 3, where *is* had to compete with the + allele of stock 602, and that in Exps. Nos. 4 and 5, where the + allele originated from Canton-*S*. In the first case the frequency of *is* has decreased to less than 10 per cent and presumably *is* will eventually disappear from this population, whereas in the latter *is* is superseding the + allele and is well on the way of being fixed. This holds for both experiments with Canton-*S* and the difference in environment does not seem to have had any other effect than to delay the progress in the greenhouse experiment.

The conclusions to be drawn from this investigation are that this special isoallele of w^+ is well enough adapted to compete successfully with normal w^+ alleles, but the outcome depends on the type of w^+ stock used. This suggests also that the w^+ alleles, which cannot at present be distinguished from each other, have different adaptive values. Finally, in one of two cases the w^{is} duplication has shown a selective advantage over the normal chromosome. This case represents an authentic instance where an increase of genetic material has taken place by means of the incorporation of a small duplication in the genome, which is postulated to have occurred repeatedly during evolution as a means to increased genetic organization.

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STATISTICS

A Fundamental Complementary Principle for Inductive Logic

THE class $\{L_i\}$, of all finitely axiomatizable systems, is well known to be formalizable in a particularly simple way, for example, as Post[1] normal systems on the axioms and rules (A, R) of each L. Now already within this class there is a potential complementarity of the following kind; for given L if one fixes R then A may vary over the equivalence class of all true sentences in L, and likewise fixing A one can show, via Turing machines, that there is an equivalence class for R.

However, and this is the vital point, such complementarity is not realizable without a postulate as to how $\{L_i\}$ is to be related by some observer, O, to the external world U. The appropriate one is that A is to be taken as an interrogation (or selective punctuation[2]) of U the response S of which is a string leading from A to a true sentence $\overline{S}$ in some L. Now O's problem, having decided on an optimality criterion $L(S, \overline{S})$ for the relation between S and $\overline{S}$, is to find the probability distribution of R.

One can set up a formalism on this basis analogous to many particle quantum mechanics in which $L(S, \overline{S})$ plays the part of a Lagrangian function. The analogy is to the many-particle theory because $L(S, \overline{S})$ must always contain the results of indefinitely many other punctuations. This in itself is of considerable interest because existing second quantum theory is in serious difficulties, due principally to the fact it is not known what makes the restriction to 4 co-ordinate dimensions. The above formalism does not have this restriction so one can consider what logical conditions on $L(S, \overline{S})$ would give it. Elsewhere[3] I show that there is a rather surprising answer to this question.

The principal interest of this formalism, however, is that it is appropriate to investigating the relation between an evolutionary system such as O and its environment U.

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