rate multiplied by the mean specific heat between 1280° and 1300° C. The curve in Fig. 1 shows the temperature distribution, measured with an optical pyrometer, obtained in some preliminary experiments. The numbers against the curve are the measured temperature changes, in degrees centigrade, due to a flow of air from left to right. In spite of the large cooling (40° C.) near the end, the temperatures of the uniform parts are unchanged. This gives experimental demonstration of the practicability of the method. The actual dip shown of 60° C. and the flow rate of 70 c.c. per minute are both too large for actual determination of specific heats.

By using platinum-iridium tubes the method should be feasible up to 2100° C., and with certain gases in tungsten or molybdenum tubes up to even higher temperatures.

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[1] Blackett, Henry, and Rideal, *Proc. Roy. Soc.*, vol. 126, p. 319; 1930; and Blackett and Henry, *Proc. Roy. Soc.*, vol. 126, p. 333; 1930.

Mortality amongst Plants and its Bearing on Natural Selection.

IT is a familiar fact that the majority of plants produce a vastly larger number of offspring than can possibly survive, but unfortunately exact quantitative observations respecting their mortality is meagre in the extreme.

In the course of collecting data for ecological purposes, certain facts have come to light regarding the death of young plants which, if typical, would appear to be of fundamental importance in any estimate of the incidence and intensity of natural selection. By briefly indicating here the nature of these preliminary observations, it is hoped that other investigators may be induced to record their experience and to collect data of a similar character so that it may be possible to judge as to how general is the phenomenon in question.

A typical example is furnished by *Silene conica* L. This plant, which is one of the steppe species in the flora of Great Britain, behaves as a 'winter-annual'. The seedlings germinate in September, and on a marked quadrat there were present, soon after germination, no less than 175 seedlings per square decimetre. By Nov. 23, whilst still in the cotyledonary stage, the number of seedlings had become reduced to 110, whilst by Jan. 31 only nine survived. There is thus not only a very high mortality amounting to nearly 95 per cent, but also the important fact is that this mortality was entirely confined to the seedling stages. All the mortality occurred prior to the formation of the second pair of foliage leaves, and all the nine survivors will clearly attain the flowering condition. A large plant of *Verbascum Thapsus* L. produced several hundred thousand seedlings, of which, however, all but 108 died during the first six months. All the survivors which attained the rosette stage flowered and produced seeds. Similarly, the winter-annual *Ranunculus parviflorus* L. in Cornwall produces large numbers of viable seeds, and sometimes the seedlings are seen in great abundance, but in an experience of this species extending over several years close observation both in culture and in the feral state, it is evident that practically the whole mortality occurs prior to the rosette phase and that almost all the individuals which attain this condition produce flowers and fruits.

Observations on the spring-germinating *Helleborus viridis* L. showed a mortality of more than 50 per cent in the first month, and observations on *Cochlearia danica*, *Dianthus prolifer*, and other species would appear to warrant the conclusion that, in these plants at least, the mortality and therefore the operation of natural selection is almost entirely confined to the juvenile stages of development. Observations on seedlings of *Fagus sylvatica* after the 'mast' year of 1922 indicate that this is true also of arboreal species. In the case of two species of *Silene*, namely, *Silene conica* and *Silene anglica*, the mortality, in the plants under observation, took place at so early a stage that, if growing intermingled, the seedlings could only have been distinguished if at all with the greatest difficulty. Of the plants which survive to the stage when the distinctive external specific and generic characters appear, almost all produce flowers and fruit and probably yield offspring.

Field observations suggest that the incidence of mortality described may well be of general occurrence. Certainly in the instances cited it would appear that the adult characters, apart from those concerned with efficient pollination and seed dispersal, can play no direct part in determining survival, but that in so far as survival is dependent upon the structure and physiology of the species, it is the characters of the juvenile, not the adult, which are important. When mortality does occur in the more adult phases of development, it is generally the result of catastrophic causes which destroy the fit and unfit with equal impartiality.

If the adult characters upon which we rely for taxonomic distinctions, apart from the exceptions mentioned, owe anything to natural selection, it must be not because of their external manifestations but because they are the inevitable consequence of those characters, probably internal, which determine survival in the juvenile stages. Any selection which might occur in the adult phase will clearly be connected with the direct production of viable seeds by individuals and not by a selection amongst progeny.

The actual selection amongst the progeny of individuals, the classical *modus operandi* of natural selection, would then appear to occur almost entirely in just those phases of development which show the greatest similarity between species, those phases which show the least divergence of morphological type. If, then, natural selection be an important factor, the uniformity of the juvenile morphology and the great diversity of that of the adult present natural selection in the guise of a factor tending towards homogeneity rather than towards the divergence of type which it has usually been supposed to bring about.

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Methyl Glyoxal as an Intermediary in Fermentation.

WHILST the earlier work on fermentation, especially Prof. Neuberg's investigation of the *second form of fermentation*, rendered the participation of methyl glyoxal as an intermediary stage probable, proof that methyl glyoxal is formed by systems capable of fermenting or glycolysing sugar has been obtained by the recent work of Toeniessen and Fischer (*Zeits. physiol. Chem.*, **161**, 254), Ariyama (*Jour. Biol. Chem.*, **77**, 395), and especially by Neuberg and Kobel and various collaborators (*Biochem. Zeits.*, **203**, 463, and later papers). The latter workers conclude that methyl glyoxal is only dismuted or fermented in presence of cozymase, whilst its formation takes place also in absence of cozymase if hexose phosphate is used as the substance of origin.

Its identification as a substance produced *in vivo*