

ural selection to eliminate either the original type or the new variety. It would, moreover, be illogical to presume that the same agent that has been instrumental in causing the disappearance of the pigment in the natural fish is the same agent, in the same locality, and under apparently the same conditions, that is instrumental in again producing pigment on the lower side.

A Precise Criterion of Species. C. B. DAVENPORT.

IN order to decide whether two allied groups are species or varieties it is necessary first to give an exact quantitative expression to the two best criteria of species—divergence and segregation—by the use of the modern mathematical method of studying individual variation. Divergence is the distance between the modes of the two groups in question expressed in units of the average deviation from the mean of the individuals of one of the groups. Segregation is inversely proportional to the number of intergrades, or it is the height of the lowest ordinate between the two modes expressed in units of the height of one of the modes.

An examination of the usage of systematists will tell us what least degree of divergence or segregation is usually expected in distinct species. Leaving the precise determination of this least degree still undecided, we may conclude: A group of allied individuals giving a dimorphic curve of a (differential) character consists of two species either when the minimum between the two groups is m [20] % or less, of the shorter mode, or when their modes diverge by n [10?] or more times the smaller average deviation of the two subgroups. Otherwise the dimorphic curve indicates two races.

Certain Results from a Study of the Variation of Littorina. H. C. BUMPUS.

THE critical study of variation in 100

specimens of *Necturus* revealed the fact that those individuals which were abnormal so far as location of the pelvis was concerned were also abnormal in respect to many others, and only remotely related characters; that those individuals which were unstable in respect to one character tended towards instability in respect to all characters; that variation of one organ was an indication of probable variation of other, if not of all, organs. The examination of over 1,700 sparrows' eggs encouraged the belief that this principle of the general instability of variants might be of further application, and in a recent article by Havelock Ellis, on *Genius and Stature*, it is concluded, on anthropological data alone, that those variations of mind which have been instrumental in producing men of eminence are accompanied by striking and remote physical variations; that those who have attained distinction as warriors, statesmen, scientists or writers have generally been above or below the mean of stature.

The speaker then exhibited 1,000 shells of *Littorina littorea* which had been arranged in order, according to their shape, from extreme elongation to extreme ventricosity, and showed that those at the extremes tended toward excessive variation in weight. Both ventricose and elongated shells were far *heavier* and *lighter* than the species of more ordinary form.

Grafting Experiments on Tadpoles, with Special Reference to the Study of the Growth and Regeneration of the Tail. R. G. HARRISON.

THE method of grafting amphibian larvæ, as described by Born in his exceedingly original and suggestive paper [*Archiv f. Entwicklungsmechanik*, Bd. 4], may be applied to the study of the normal growth of the embryo. Thus, when portions of larvæ of *Rana virescens* and *R. palustris* are combined in various ways to form a complete normal organism, the sharp con-