DISCUSSION

THE RELATION BETWEEN A NEGLECTED CLASS OF FACTS AND THE UNIVERSAL LAW OF ORGANIC EVOLUTION

THE importance to science of the dates of specific names is recognized. No stable nomenclature is attainable, even in a remote future, if they be disregarded. But to dates of first collection of species no such obvious weight attaches. Great as is the improvement in this respect, it is not yet by any means the universal practice to include even the date of collection of the type in the description of new forms. A generation or two ago such dates were commonly omitted, and to determine the dates of collection of specimens older than the type then or now is a matter of no little difficulty.

Yet dates of first collection are basic biological facts. They depend very definitely upon the location and extent of specific ranges. And, biologically speaking, where species are is second only in importance to what they are. In fact, they are where they are, because they are what they are.

These dates of first collection permit comparisons of various kinds to be made with respect to the time-order of discovery of known species; and from such comparisons interesting results, of which the following are an earnest, may be anticipated.

Investigation shows that in the Chiroptera, for example, the species of smaller genera make up a smaller proportion of the first than of the second half of the known total to be discovered. Or putting this generalization in other words, species of the larger genera are discovered more often early than late; of the smaller genera, more often late than early.

It is a perfectly natural conclusion that this inverse relation depends upon peculiarities in the distribution of species of the two sorts of genera, but this is at present somewhat beside the point. The main fact is that the species of to-day's small genera make up a larger proportion of the total known species of bats than they did in the early collections. By extension of the reasoning it is to be inferred that of the actual small genera in the world—those that will be the small genera at last when the census of species is complete—will form as that time approaches a larger and larger proportion of the known total.

Under these circumstances it is clear that the curve of genera plotted by size will change as time passes, and change in a predictable way.

This raises an old problem in new form.

Biologists must ask themselves now, not why the curves of genera plotted to species should be essentially uniform for the different natural groups of plants and animals, as Dr. J. C. Willis discovered them to be. Instead, they must ask why these curves, now alike, are changing in the same direction, and apparently approaching the same limit.

Dr. Willis's discovery means that there is one law of evolution manifest upon the same terms in all natural groups of organisms. For if in different groups the proportionate number of genera of different sizes is constant, genera are multiplied and with the passage of time increase in size according to one system, and one only.

What this system may be is, of course, not to be discovered through analysis of empirical curves of genera plotted to species, but through study of the limiting form toward which they are moving.

Under the circumstances it quickens the imagination to discover that this limiting curve is at least very close to, if not identical with, a definite mathematical function of the curve of normal frequency. As a matter of fact, there is independent and apparently conclusive reason for believing that precisely this function of the normal curve is the ideal to which the curve of genera plotted to species should conform.

The equation of the ideal may be written in terms of the constants and variables of the normal curve. This equation gives the law of evolution as concise and accurate expression as is possible. It was stated, not altogether correctly, in more familiar terms in an earlier issue of SCIENCE.[1] In corrected form it appears in the *Anatomical Record*.[2]

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THERE IS NO CONTROL

A WORD is needed to mean definitely the things we can do to avoid injury from pests affecting crops. The writer was one of those who early adopted the word control with the hope that this word when applied to insect pests would come to mean precisely that. Every one will admit that this is the chief meaning at present, but *there is no control of language* because there are just enough people who insist on stretching it to cover other meanings to leave it uncertain.

Let us suppose the case of a farmer writing to me concerning a certain pest and asking how it is con-

[1] W. H. Longley, "A Note upon the Probable Mode of Evolution," SCIENCE, 69: 462–465, May 3, 1929.

[2] 44: 241, 1929.