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.

trolled. I might answer, "My dear fellow, the pest is already controlled by lethal factors and fluctuations of food supply, the cold, heat, winds and storms control it as do natural barriers, such as rivers, etc., and besides certain birds and beetles control it. Likewise, a fly parasite and a parasite wasp. Unfortunately, the latter is also controlled by a hyperparasite." In reply, supposing his anger was controlled by various inhibitions, including an inferiority complex, he might say, "Excuse me that I did not use the right word, but I am an unlearned and ignorant man. The insect has now controlled the crop and it is all dead."

I want to protest again and as strongly as I know how against the above uses of the word for meanings for which there are so many more precise designations and to urge that these other words be used, such as natural checks, climatic restrictions, topographical barriers, biological limitations or even environmental resistance for all these things that have no direct practical bearing on the problems of the farmer. He is thinking of the things that he can do to avoid the losses due to insects, fungi and other troubles. Control in this usual sense applies correctly in such cases as frost control which is accomplished by orchard heating and to moisture control by means of irrigation and cultivation. It would be just as bad to confuse these practices with meteorological limitations, restrictions or barriers. Our cooperative associations are beginning to accomplish very effectively the control of marketing to avoid this class of losses. In this work one also meets with commercial limitations, checks and barriers that must be considered, but must not be confused with what we can do to obtain better prices.

Those who insist on using the word control to express also other ideas should at least suggest another word that could be exclusively used to mean precisely what the great majority do mean when they say control.

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BLACK WALNUT CANKER

IN the fall of 1929, the extension specialist in forestry at West Virginia University, Mr. T. W. Skuce, informed me of the occurrence in the north central part of this state of a serious canker on the black walnut, *Juglans nigra* L. It was not until February, 1930, that I was able to obtain specimens in the field.

This disease has been observed upon trees varying in diameter from three to twenty inches. The cankers are located at any point on the older wood but are most conspicuous upon the trunk and larger branches where they form "cat-faces" or targets composed of very prominent concentric rings of callus tissue. The margins of the cankers are very rough, being composed of the last formed and largest roll of callus tissue, together with the attached bark. This gives the characteristic cankers a concentric flaring appearance with a diameter which is usually greater than the diameter of the trunk or limb at the point of canker formation. What appear to be young infections often show a burl-like growth before they open up to form the concentric rings so typical of the older cankers.

It has been noted also that whenever a tree is attacked several cankers are present and are well distributed on the trunk and larger limbs. Other trees near by may show no symptoms of disease. This is suggestive of an inherent difference in susceptibility among trees of similar ages in the same stand.

On many of the cankers, most commonly on the callus rings of two or three years ago, the perithecia of a Nectria are abundantly formed.

The appearance of this Nectria associated with such characteristic cankers suggests that this disease is closely related to the European canker which is well known in Europe on beech and other deciduous trees, and in America on the cultivated apple, but not reported as occurring upon black walnut. In fact, there are no published records so far as I can ascertain of this disease of the black walnut.

Because of the commercial importance of the black walnut in West Virginia and the fact that this disease renders the timber practically worthless, arrangements have been made by the Agricultural Experiment Station of West Virginia to conduct an investigation of this disease, including its geographical distribution, its origin, nature, host range, importance and the conditions surrounding infection and spread by the pathogen. This note is published to call attention to the black walnut canker; any information regarding its occurrence anywhere will be gratefully received.

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DUTCH ELM DISEASE IN OHIO

SEVERAL cases of the Dutch elm disease have been found in Ohio. The field symptoms exhibited were similar to those of the Dutch elm disease. The leaves wilted on certain branches or over the entire tree. Later, they turned yellow and dropped. The affected limbs died. When cross sections were made the typical brown discoloration of the vascular tissue was found, appearing generally as a broken ring but sometimes forming a complete circle. When the bark