in the separate sciences—usually falling within the probable error of position. But the academy has no method of comparing performance in different sciences, and if one science has less than its proper representation, the disparity is likely to increase rather than to decrease. Thus there are in the country about half as many astronomers as botanists, but there are twice as many astronomers in the academy. The second principal variation in the membership of the academy is due to the fact that men do not always retain the positions that they hold when elected. Apart from the somewhat greater accuracy, the superiority of this list consists in the assignment of probable errors of position. Thus the probable error at the close of the first hundred is about 25 places, that is, there are about 25 men not in an ideal academy of a hundred, whose chances of belonging there are at least one in four. A list such as this would also give us academies of any desired size—the sixty most eminent men of science, as in the Paris Academy, the hundred or thereabouts as in the National Academy, or the 450 or thereabouts, as in the Royal Society.

While under existing conditions of sentiment, the publication of a list of our thousand leading men of science in the order of merit with the probable errors would not be tolerated, I have indicated those who are included in the thousand in my 'Biographical Directory of American Men of Science,' a work of reference that may be regarded as a by-product of this study. I did this with some hesitation, but it seemed best to place on record those who were the subjects of this research, more especially as this could be done without any invidiousness. The probable error toward the end of the list is about 100 places, so there are one hundred others who have at least one chance in four of belonging to this group. Further, several scientific men of standing were omitted from the lists as originally drawn up, and were not considered in making the arrangements. Consequently, while each of those indicated in the Biographical Directory is probably one of the leading thousand American men of science, there are others not indicated who belong to this group. This, however, is a minor factor, and we have with sufficient accuracy for statistical purposes a group of the leading thousand American men of science arranged in the order of merit with the probable errors of position known.

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A NOTE ON ASSORTATIVE MATING.

IN the natural selection and topographic isolation theories combined there is offered a plausible explanation of the means whereby species may be derived from other species, granted that the derived species do not occupy the same geographic (topographic) range as the parent form. Where they do, some new aid to natural selection in place of topographic isolation must be invoked to explain how slight variation may be progressively increased until differences of selective worth exist between parent and splitting-off types. Determinate variation and physiological isolation are two such aids proposed. The latter (with which Romanes's name is familiarly associated) assumes that among the members of a species living in the same locality there may be among the inevitable slight fluctuating variations some of such a character as to lead to assortative mating, *i. e.*, that individuals of certain like variation may tend to mate together, either because of mutual attraction between like, or of mutual repulsion between unlike forms. This tendency to selective or assortative mating between like individuals may come to result in time in such an increase of differentiation among groups of individuals of the species, although these groups may live side by side or confusedly mingled with each other in the same locality, that mating between unlike groups will become physiologically impossible. That is, that these groups will constitute distinct species.

The facts of observation or experiment adduced to support this theory are very few. Indeed, I do not recall any at the present moment. Nevertheless, the need of an aid to selection capable of bringing slight continuous fluctuating variation up to a life-and-death selective value, and the generally plausible character of this theory of Romanes (and of

other earlier evolutionists) has given it a certain standing in the literature of bionomics.

A student in my laboratory, Miss Lilian Ramsay, in a general study of variation and heredity in certain insects, has been able to gather some definite data in regard to assortative mating (the basic assumption of the physiological isolation theory) in the case of an insect species common on our university campus. Unfortunately the earthquake of last April interrupted her interesting observations. Her data are the following:

The lady-bird beetle, *Hippodamia convergens,* is an insect of much variability as to its dorsal color pattern (dorsal surfaces of the two wing-covers). The modal type shows a red-brown ground bearing twelve small black spots (six on each wing-cover). The variation in additions to or subtractions from these normal twelve spots, and in their arrangement, is so large, extending from a condition of total absence of spots to that of the presence of eighteen distinct spots, that we have been able to describe, in words, some eighty-four 'aberrations' or pattern[1] types of this species. As any of these variations may appear in conjunction with any others in a single brood (one clutch of eggs), it is certain that these aberrations are all included within the species. Is there now any assortative mating among these variations?

In March and April Miss Ramsay found the beetles mating on the wild mustard on which their food, the mustard aphis, swarms. Collecting these actually mating couples, she brought them into the laboratory, noted the pattern types to see if assortative mating on a basis of pattern—this being largely the basis for specific separation in the genus—was occurring, then put each couple into a breeding jar to obtain the eggs and rear the young, to ascertain if the various matings were similarly fertile. The earthquake interrupted the collecting and made impossible the determination of fertility. The actual matings of sixty couples as they occurred normally in nature were as follows:

Thirty cases of twelve-spotted *Hippodamia convergens* with twelve-spotted *H. convergens.*

Thirteen cases of twelve-spotted *H. convergens* with spotless *H. convergens.*

Five cases of spotless *H. convergens* with spotless *H. convergens.*

Two cases of twelve-spotted *H. convergens* with two-spotted *H. convergens.*

Two cases of one-spotted *H. convergens* with spotless *H. convergens.*

One case of twelve-spotted *H. convergens* with ten-spotted *H. convergens.*

One case of two-spotted *H. convergens* with spotless *H. convergens.*

One case of spotless *H. convergens* (female) with *Megilla vittigera* (male), a distinct species with three strong, longitudinal stripes instead of spots.

Also there were noted seven cases of the mating of plain *Coccinella californica* with plain *C. californica,* and one case of plain *C. californica* with two-spotted *C. californica. Coccinella californica* also frequently mates with *Hippodamia convergens,* as we have observed at various times.

As regards relative abundance of the various variation types of *Hippodamia* and *Coccinella,* the twelve-spotted and the spotless *Hippodamia* individuals far outnumbered any other types and the spotless *Coccinellas* were much more numerous than spotted ones.

The matings, therefore, seem obviously to be wholly non-selective; they are chance matings, that is, follow the law of probability. All the individuals, spotless, twelve-spot and few-spot, mingle freely on the same mustard plant, so that the matings might readily be assortative. If not assortative, then the relative proportion of numbers of the different types should determine the matings. And this is what apparently really obtains.

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[1] See Kellogg and Bell, 'Studies of Variation in Insects,' *Proc. Wash. Acad. Sci.,* Vol. 6, pp. 203–332, 1904, for a detailed account of the variation of the species.

THE SALARIES OF PROFESSORS.[1]

Despite the heavy burdens upon the cor-

[1] From the report of President Butler, of Columbia University.