

were kept in a dry situation; thirty-two were dead in twelve days; all dead in twenty-two days; the males died first; a few ova were deposited during the first week. This experiment was repeated three times.

Experiment 7.—As to the rate of feeding, five experiments were tried. The beetles numbered fourteen to twenty-one, and the times from 3½ to 168 hours; the average of the five trials was, one beetle will eat one square inch of potato leaves in thirty hours; the maximum rate was ten hours, minimum was thirty-seven hours. It may be stated that one beetle during its imago life, will defoliate one plant of potatoes.

Experiment 8.—Aug. 20. Took in fifty beetles which had been well fed; eleven immediately buried themselves in the sand. September 6. All dead above ground; turned out the sand and found the eleven alive; replaced sand, also beetles; eight at once buried themselves. September 15. Three remaining on surface dead. September 20. Found all on surface of sand, which I found quite dry; on wetting sand all went down, are now alive October 16.

Experiment 9.—September 1. Took 100 *Doryphora* larvæ, some immature, fed them on potato. Sept. 10, all pupating. Sept. 20, 15 beetles out. Oct. 1, beetles all dead. On turning out the sand found that none had hibernated. This agrees with the results of seven experiments, and shows that there was no disposition to hibernate until after the middle of August, and then only by beetles which had fed.

The date of hibernation will vary according as the season is warm or cold, but I think it pretty certain that beetles which have not fed will not survive the winter.

A result of experiment 4 was the finding of a pupa case of *Lydella doryphora* under conditions which were fully narrated to you at our September meeting, and which you all agreed were conclusive as to the advent of this farmer's friend in Toronto.

It is hoped the publication of this will elicit evidence of its occurrence in other counties in Ontario, but it must be borne in mind that the very general use of Paris green by potato growers has hitherto prevented the increase of this as well as other natural enemies of *D. 10 lineata*; has, in fact, rendered their existence almost impossible.

A VALUABLE COW.—A cow which was purchased here from Mr. Moses Harris, Hebron, by a Boston gentleman, for \$300, will be shipped via the *Dominion* this evening. The cow was a thoroughbred Jersey, registered on the American herd book.—*Yarmouth Times*.

THE EVOLUTION OF THE AMERICAN TROTTING-HORSE.

[Wm. H. Brewer, "American Journal of Science" and "Nature."]

The American trotting-horse is an example of a new breed of animals in process of formation. As yet it can hardly be called a definite breed in which the special and distinctive character is either fully developed in quality or satisfactorily fixed by heredity. Great progress has, however, been made, many individual animals have attained great speed, and all the better ones have derived their trotting excellence, in part at least, through heredity.

The origin of most breeds is involved in considerable obscurity, as to how much they are due to conscious and how much to unconscious selection, what motives led to this selection, how far the enhancement of the special qualities have been due to physical environment, and how far to education, training, nourishment, or cultivation. The formation of this new breed is so recent, the development of a special quality has been so marked, there is such an abundant literature pertaining to its history, the system of sporting "records" is so carefully planned and comprehensively conducted, and withal has become so extensive, that we have the data for a reasonably accurate determination of the influences at work which led to this new breed being made, the materials of which it is made, and the rate of progress of the special evolution.

It is as an implement of gambling and sport that the trotter has his chief value to the biological student. Sporting events are published or recorded as the mere everyday use of animals is not, and the records of races give numerical data by which to measure the rate of progress. Similar data do not exist for the study of the evolution of any other breed.

Incidental to the preparation of a paper pertaining to this matter for farmers and breeders, I have compiled and collated certain data which have a scientific as well as economic value, the more interesting portion of which I condense for this paper.

The horse has several gaits which he uses naturally, that is, instinctively. And besides those which are natural, he has been taught several artificial ones, some of which have been much used, particularly in the middle ages. But to trot fast was not natural to horses; when urged to speed they never assumed it, and until within a century the gait was neither cultivated nor wanted by any class of horsemen. A breed of fast trotters, had it been miraculously created, would doubtless soon have perished in that it would have had no use, satisfied

no fancy, and found no place in either the social or industrial world as it then was. Before the present century the chief and almost sole uses of the horse were as an implement of war, an instrument of sport and ceremony, an index of rank and wealth, and an article of beauty.

For all these uses, as then pursued, a fast trotter was not suited, nor was he better adapted to the heavy coaches over rough roads, or the slow waggon-trains of armies. The horse best adapted to all these, however much he may have varied as to size, strength and fleetness, was one whose fast gait was the gallop or run rather than the trot. For leisurely horseback travelling the ambling gait (or *pace* gait as it came to be called in America) was preferred. With increasing uses of horses for draft, certain heavy but slow breeds were developed in the Old World, of which the Dutch, Clydesdale, and Norman breeds are examples.

The causes which led to the cultivation of the trotting gait in this country, and the evolution of a breed with which it should be instinctively the fast gait, were various, and the separate value of each as a factor in the problem would be very differently estimated by different persons studying the subject from different points of view. Now that he is so valuable and plays such a part as a horse of use, it is easy to see why a breed of trotting roadsters should be produced to meet certain important demands of our modern civilization. But this does not explain how the process actually began.

Reasoning *a priori*, the trotter, as a horse of use, should have originated in western Europe; as a matter of fact, he not only did not begin there, but he was unpopular there until well developed here. Locomotives began to draw armies to the battle-field, the war-horse declined in actual as well as relative importance, the modern, light, steel-spring, one-horse, convenient business waggon as well as the modern buggy came into common use after trotting as a sport was established, and after the gait had been extensively cultivated and bred to. The trotting-horse is specially adapted to various modern uses, but these uses followed his development, rather than led it, although in later days this factor has been an important one in the rate of progress.

The influences which originally led to the starting of the breed were more social than economical; a similar fact a century earlier marked the founding of that famous running breed, the English thoroughbred. The origin of the trotter, however, was not so simple as that, and several diverse social factors were involved, only the chief of which will here be noticed.

From early colonial times horses have been more generally owned by the masses of the people here than in any country of