

heredity could do nothing for us in our work of selection, were it not for the fact that variations occur, but around a new centre, as it were, in each generation during selection.

The weeding out of undesirable stock is the greatest task of the queen-breeder. He must pursue his work by (1), inducing variation; (2), producing large numbers of individuals; (3), weeding out all undesirable blood by breeding from but one, or very few select animals, and (4), fixing the type. In queen breeding this means that hundreds of queens must be bred and tested every year and a very few chosen to continue the work during the following season; it does not seem best to use as small numbers as do most queen breeders. The Funks in their work on corn breeding tested five thousand ears which bore no relation to each other, and chose two as breeding stock. Luther Burbank, the wizard of horticulture, advocates even larger numbers, having chosen one in ten thousand from among some of his plants. In queen breeding we are more restricted by the limitations of any locality but I think I am right when I say that a breeding queen should be the best in at least five hundred tested queens, and the test is to be made by the actual amount of honey produced in a year as compared with the other four hundred and ninety-nine, always assuming, of course, purity of stock. Cattlemen use scales, and the Babcock test as the only safe method of choosing the dairy cow; let us use scales in our judgment and disregard color and other fads when rearing honey producers.

For "fancy" bee-keeping, as practiced by many amateurs, color or anything else that attracts may be used.

Since mating cannot be controlled in bees as in mammals, it will be necessary to have several colonies producing drones, but every colony chosen for this

purpose should have a high honey record of at least one year's standing, and the queen should be quite as good as the breeding queen. The majority of bee-keepers are notoriously lax in this regard. In many cases the drones of every colony in the yard are allowed to fly and just so long as this is done we will have no advancement, for this one-sided selection is working against odds that the bee-keeper cannot overcome. In defense of such loose methods some queen breeders argue that a very large number of drones are necessary and that they can be procured in no other way. During the past summer in sixteen colonies in the Arlington yard of the Bureau of Entomology I produced enough Caucasian drones to stock a queen breeding yard with an output of two thousand queens a year and this could have been done with half that number to advantage. I may add also that pure matings were secured in the very large majority of cases although that apiary is far from being isolated; I mention this to show that more drones are unnecessary.

We have pedigreed horses and corn and even pedigreed corn and wheat why not pedigreed bees? I think I am not asking too much. I hope the day will come when the breeders will advertise as follows: "I am this year using my celebrated breeding queen Smith 168, which is the mother of a colony which last year produced 50 per cent. more honey than my average colony. This queen is the descendant of six purely mated queens all of which were mothers of colonies producing over three hundred pounds of honey a year. For drones I am using the queens, all of which are mothers of colonies which last year produced over three hundred pounds each." This is not visionary by any means, for it is exactly what breeders of other stocks are doing, and it is pleasant to know that some wide-awake queen breeders

are doing almost

There is the only producing of honey in one year in a good season manipulation, but a queen was was not made the of breeders to be the United States producers are so situated can produce any but it is necessary.

There are two additional considerations of the desirability of pure. Crosses or able that they should be except when necessary from Dr. W. E. Caversary, on this point.

"Since cross breeding modifies characters conform to the law of inheritance, and is them when they are pure, it should be extreme caution, and who has a definite fairly clear idea of obtain it.

"The purity of should be carefully attention should be given when individuals are apparent, it may be pure or else in a suitable matings a realization, provided superior animals.

"At the same time on the lookout for qualities of merit. discouraged if it is attributed to the immediate character of the children from the grandchild made a racial