8. The chemical physiology and color chemistry of fowl, including the chemistry of the egg.
9. Embryology of the chick's organs and functions.
10. Hygiene and pathology of fowl.
11. Poultry houses, fences and furniture.
12. Trapnests and identification bands,
13. General physiology of breeding, including mating habits, sexual selection and fertility effects of inbreeding.
15. Artificial brooding and feeding.
16. Physiology, hygiene and pathology of chick development; temperature, exercise, chick diseases and parasites.
17. Heredity of characteristics.
18. Variability and sporting in fowl.
19. Fancy breeding, clubs, shows, prizes, etc.
20. Competition contests for egg-laying and for fattening.
21. Technique of increasing egg yield by feeding and breeding.
22. Technique of economical flesh production: fattening, caponizing and killing.
23. The poultry market:
 - a. Statistics of offerings.
 - b. Statistics of prices.
 - c. Technique of advantageous marketing,

It should be the duty of each subcommittee to make, through one or more of its members, a careful investigation into the matter under its charge, the public reports on its investigations, and to report, from time to time, to the American Breeders' Association on the more important results they have gained.

ARTIFICIAL VS. NATURAL INCUBATION.

BY PROF. JAMES DRYDEN, *Corvallis, Ore.*

A mild sensation has been created by the publication of the results of poultry breeding experiments at the Maine station. After nine years' selective breeding for high egg production "there is no evidence," the report says, "of any increase in the average production of the flock." (Maine Bul. 157.)

This is probably the most discouraging statement that has ever come from an experiment station, so far as poultry breeding work is concerned; and if the same laws of heredity prevail with farm livestock as with poultry, it is a disappointment to animal breeders generally.

It is not claimed, however, that the results settle the question of transmission or non-transmission of high egg productiveness, though it has given many poultry writers an excuse for asserting the futility of poultry breeding work. Instead of discouraging workers, however, along this line, it forcibly emphasizes the need for earnest consideration of methods of breeding.

High egg production will always be associated with high vitality in the stock, and any method that does not guarantee the maintenance of constitutional vigor, whether it be methods of feeding or housing or general care, ought to be discarded.

During the year another "discouraging" bulletin has been published, Bulletin 100 of the Oregon station. The experiments reported in this bulletin seem to show conclusively the utter futility of trying to maintain the vitality of the stock where artificial methods of incubation are employed. They show that the efficiency of incubators is very much less than that of hens. Not only did the incubators hatch a smaller percentage of the eggs, but the chicks had less vitality than the hen-hatched chicks, as was shown in the high mortality of incubator chicks. Besides, the hen-hatched chicks showed a greater rate of growth than the incubator chicks.

It is the opinion of the writer, based on investigations covering a number of years, that artificial incubation is responsible for more failures and greater losses in the poultry business than any other one thing and until artificial methods can be greatly improved the hatching should, be done by the hen.

The relative efficiency of artificial and natural hatching was determined in different ways. Eggs of the same kind were divided among many incubators and sitting hens. From 879 eggs set the incubators hatched 533 chicks, or 60.6 per cent. From 279 eggs, hens hatched 219 chicks, or 78.8 per cent. Some of the eggs were broken in the nest, which would probably have hatched. If these be eliminated in the computation, the hens hatched 88.2 per cent of eggs set. Of the "fertile" eggs or those left in the machine or under the hens after testing out all that showed infertile or dead embryos, the incubators hatched 78.3 per cent, and the hens 96.5 per cent. Eggs incubated artificially tested out 22.7 per cent as "infertile," while those incubated under hens tested out 11.8 per cent, showing that the per cent of fertile eggs hatched is not a fair test of the relative efficiency of hen and incubator hatching.

The incubators showed 16.6 per cent of fully formed chicks "dead in the shell," and the hens 2.8 per cent.

The results show that not only do incubators hatch a smaller percentage of chicks from a given number of eggs than the hens, they also show that the artificial method is productive of "infertility" if all eggs that are tested out as infertile are to be so rated. This of course, is not the case because many of the tested out eggs have been fertile, but during the process of incubation the embryo has died in the shell.

The serious problem, however, is probably not how to hatch a certain percentage of the eggs set, but how to hatch the greatest number of chicks of good vitality. A study of the vitality of the chicks was made. Chicks hatched under hens weighed when hatched heavier than chicks hatched in incubators. The death rate of hen-hatched chicks brooded in artificial brooders was 10.8 per cent and of incubator chicks 33.5 per cent. The death rate in hen-hatched chicks brooded by hens was 2.2 per cent and of incubator chicks 49.2 per cent in four weeks. Other tests showed a mortality of 46.5 per cent of incubator chicks brooded by hens and 58.4 brooded by brooders. In this way the low vitality was traced directly to the incubators as the cause, and the various theories that the mortality in brooder chicks was due to improper brooding or feeding of the chicks or to lack of vigor in the parent stock were shown to be without foundation.

In the nine years' breeding work at the Maine station artificial methods were used in hatching and brooding the chicks, and while we are guessing at the failure to secure a higher egg yield in those experiments I venture the guess that the failure was due to a gradual lowering of vitality in the stock by artificial incubation.

It seems especially desirable that any poultry breeding work looking to increased egg production should not be dependent upon the success or failure of artificial methods of hatching.

THE FACTOR HYPOTHESIS IN ITS RELATION TO PLUMAGE COLOR.

By C. B. DAVENPORT, *Cold Spring Harbor, N. Y.*

An egg that is one millimeter in diameter contains all the materials necessary to determine the different characteristics of an ox. And not an ox, merely, but an ox of particular breed and strain, with peculiarities of proportions, of head and horns, of length, quality and color of the hairs. When we contemplate such facts we are forced to conclude that there are, in the egg, representatives of each part and that these must