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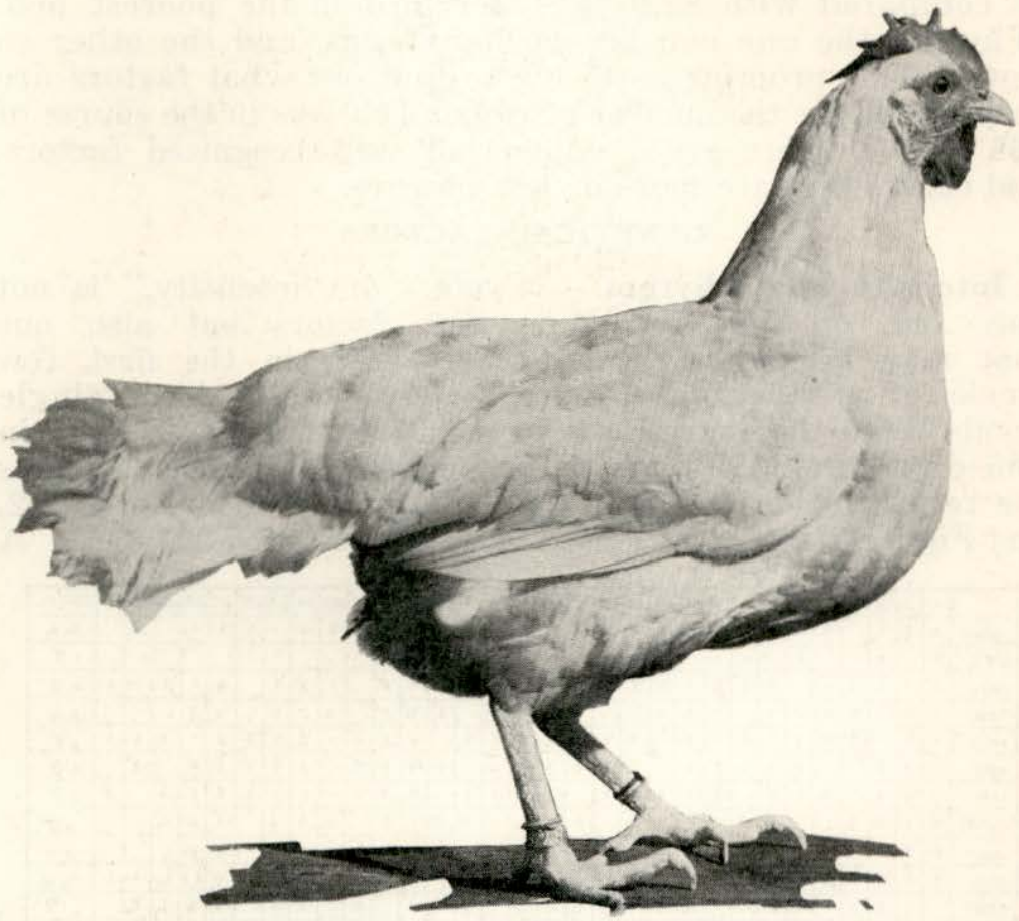

Single Comb White Leghorn hen No. B-6827, photographed at the end of her fifth laying year. This hen had enough intensity and persistency to lay 961 eggs in five years. She weighed 3¼ pounds when she laid her first egg as a pullet, and when this photograph was taken she weighed 4¼ pounds.

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COLLEGE OF AGRICULTURE
EXPERIMENT STATION
LINCOLN
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The 1929 report of the Storrs Egg Laying Contest, which has been conducted at Storrs, Connecticut, twenty-one years, shows that the best pen of ten hens entered laid 2,802 eggs, and the poorest pen laid 829 eggs. In the best pen the average egg production per hen was 280.2 eggs as compared with 82.9 eggs per bird in the poorest pen. Why did the one pen lay so many eggs, and the other so few? This prompts us to try to find out what factors are responsible for the number of eggs a hen lays in the course of 365 days. There are a number of well-recognized factors, and others that are more or less obscure.

GENETICAL FACTORS

Intensity and Rhythm.—"Cycle," or "intensity," is not only one of the very important factors but also one that may be measured quite accurately in the first few weeks of production. Figure 1 shows the cycle of Single Comb White Leghorn Hen No. L-997 that laid 240 eggs in 365 days, and 259 eggs before molting. Figure 2 shows the record made by Single Comb White Leghorn No. L-362, and Figure 3 shows the daily record of L-843 for 365 days. A

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
NOV.	X	X	X		X	X			X	X	X	X			X	X	X	X	X		X	X	X	X		X	X	X		X		22
DEC.	X		X			X		X	X		X	X	X		X																	9
JAN.			X	X	X		X	X	X	X	X	X		X	X	X	X		X	X	X		X	X	X		X	X	X		X	23
FEB.	X	X		X	X	X	X		X	X	X				X	X	X		X	X	X		X	X	X		X	X				20
MCH.	X	X		X	X	X		X	X	X		X	X		X	X	X	Y		X	X	X		X	X	X	X		X	X	X	24
APR.		X	X			X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X	X	X	Y	X		X		23
MAY	X	X	X		X	X	X		X	X	X	X	X		X	X	X	X		X	X	X		X	X	X	X	X	X		X	25
JUNE	X	X	X	X		X	X	X	X	X		X		Y	X	X		X	X	X	X		X	X	X		X	X	X			23
JULY	X	X		X	X	X	X				X	X		X	X	X		X	X		X	X		X	X		X	X	X			20
AUG.	X	X	X		X	X		X	X		X	X		X			X	X			X	X	X		X		X		X	X	X	20
SEPT.			X	X		X	X			X	X		X	X	X			X		X		X		X	X		X	X		X		17
OCT.			X		X	X			X			X	X		X	X	X		X	X			X		X			X				14
																															TOTAL	240

FIG. 1.—Year's record of Hen No. L-997.

hen that lays two days in succession, misses one day, and lays two more days in succession and continues in this manner, is said to have a "two—one" cycle. Such a bird would produce 20 eggs in 30 days. L-997, as shown in Figure 1, did not have a perfectly rhythmical cycle. For example, in November she laid eggs on the first, second, and third and missed the fourth day, and then laid on the fifth and sixth and missed the seventh and eighth. Rhythm is the regularity with which a bird repeats her cycles. Superior layers usually have regular rhythm.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
SEPT.																									X		X	X		X		4
OCT.		X		X	X		X		X	X		X	X			X	X		X	X	X		X	X	X		X	X		X	X	20
NOV.	X	X		X	X		X	X	X		X	X	X	X		X	X	X		X	X		X	X	X	X		X	X	X		23
DEC.		X	X		X	X	X		X	X		X	X	X		X	X	X	X	X	X	X	X	X		X	X		X			22
JAN.	X	X		X	X	X		X	X					X			X		X	X		X	X	X		X	X		X	X		18
FEB.		X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X		X	X	X		X	X	X					22
MCH.		X	X	X		X	X	X		X		X		X	X	X		X	X		X	X	X	X		X	X		X	X	X	22
APR.		X	X		X	X			X	X	X	X		X	X	X		X	X	X		X	X		X	X	X		X	X		21
MAY	X		X	X	X		X	X		X	X	X		X	X	X	X		X	X	X		X	X		X	X		X	X		23
JUNE		X	X		X	X		X	X		X	X		X	X	X	X		X	X	X		X	X	X		X	X				20
JULY		X		X	X		X	X	X		X	X		X							X											10
AUG.			X																								X	X				3
																															TOTAL	208

FIG. 2.—Year's record of Hen No. L-362.

Persistency.—Pullet No. L-362 did not have any better rhythm or intensity, and eventually laid 32 fewer eggs, partly because her intensity was not quite so good, but more especially because she had less persistency. In the last two months she produced only 13 eggs, while L-997 laid 31. To make satisfactory records a laying pullet must have good intensity, no long pauses, and good persistency. A bird with good intensity for six or seven months may make a record of 130 to 140 eggs, but can never really be a profitable producer.

Birds with a low intensity usually do not have good persistency. L-997 laid at a profitable rate, outside of a pause in December, for thirteen months, for she laid 19 eggs during November, her thirteenth month. In other words, she produced 259 eggs during her pullet year. L-362 laid at a profitable rate for only about ten months. L-843 laid at about the same rate for eight months, and then slowly fell off. If these three birds had been trapnested during their first five weeks of production, sufficient information would have been obtained to have caused rejection of L-843

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
OCT.		X		X			X	X			X		X		X			X	X			X			X		X		X			13
NOV.	X			X	X		X			X		X		X		X			X			X	X	X			X	X		X		15
DEC.				X		X	X			X		X		X			X	X			X		X		X	X			X			13
JAN.		X				X			X	X		X		X			X			X		X		X			X	X				12
FEB.	X		X			X	X		X	X			X	X			X		X		X		X		X	X		X				15
MCH.	X	X			X		X		X		X		X	X			X	X		X		X		X			X		X		X	16
APR.	X	X			X											X	X		X	X		X	X		X		X		X			12
MAY		X		X			X	X		X	X		X	X		X		X		X		X	X		X	X		X	X		X	18
JUNE			X			X		X		X		X	X		X	X			X			X			X	X		X		X		14
JULY		X			X	X		X		X			X			X			X		X				X			X				11
AUG.			X			X			X					X					X	X				X	X			X				9
SEPT.				X			X					X			X																	3
																															TOTAL	151

FIG. 3.—Year's record of Hen No. L-843.

as a medium to poor layer and the selection of the other two as good layers. If one is equipped to raise more pullets than he desires to house, trapnests will soon pay for themselves in locating the poor producers. Besides, the pullets that lay eggs undesirable for market purposes may be found and disposed of.

Early Maturity.—Another quality that most good layers possess is early maturity. In a pen of 500 pullets the first half to come into production is always the better half. They will show better cycles, fewer pauses, and greater persistency.

Why do some birds mature earlier, possess greater intensity, experience few pauses, and have great persistency, while others are slow to mature, show a low intensity, a number of pauses, and a low persistency?

The domestic fowl is much more complexly organized than one might think. The diagram below (Fig. 4) indicates the special work done by each of the ten functional systems.

Unless each of these systems is functioning properly and all of them are working harmoniously together, the bird whose existence depends upon them is abnormal and of little or no utility. Just as a domestic fowl is made of these systems, so is each system composed of smaller units. For example, the nervous system is composed of brain,

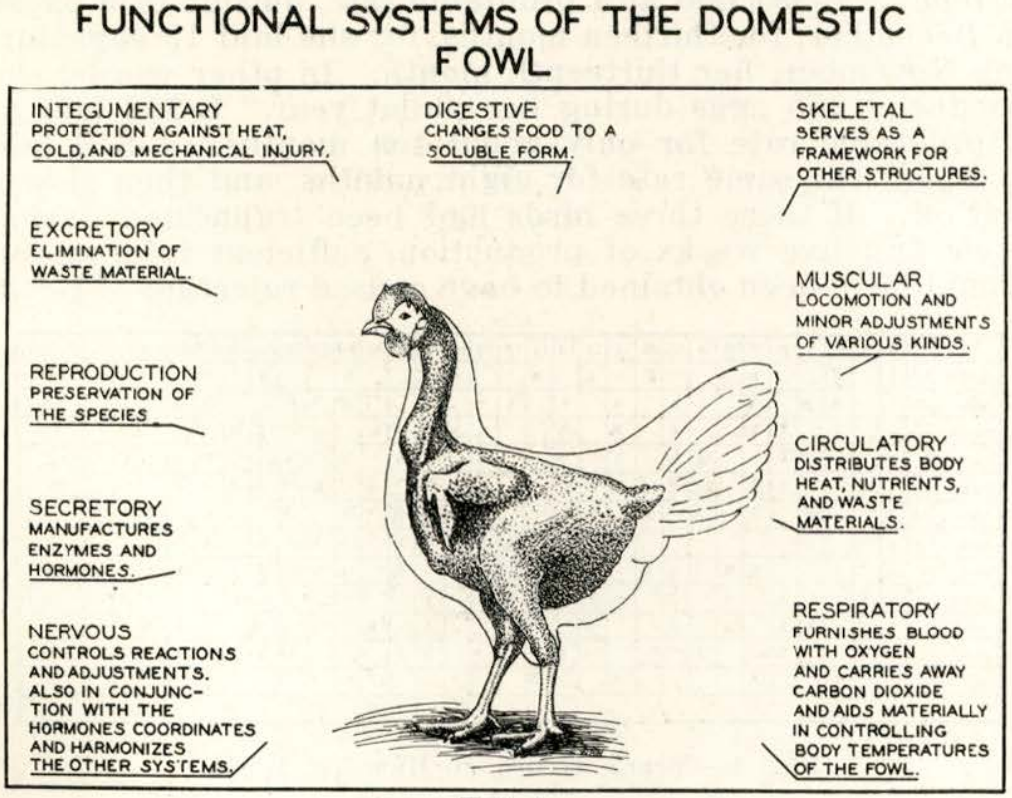

FIG. 4.

spinal cord, and nerves. Each of these structures is further made up of minute parts called cells.

The Structure and Nature of Cells.—The basic units of all of the systems shown on page 4 is the cell. The cell, like the systems, has a complex organization. Figure 5 represents

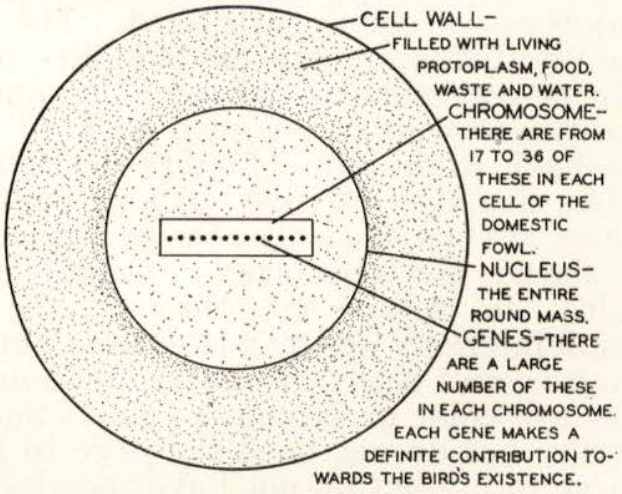

FIG. 5.—Diagrammatic picture of the cell.

a diagrammatical picture of a cell with the more important parts.

The parts of the cell that we are most concerned with are the chromosomes and their genes or character determiners. Each cell of a chicken contains 35 or 36 chromosomes, with the exception of the eggs and sperms, which have either 17 or 18. Each chromosome contains a large number of genes.

Whether a bird is black or white depends on the particular kind of genes it carries in the cells of its body. One egg hatches into a Buff Cochin Bantam and another becomes a Barred Plymouth Rock because each egg had a set of genes that determined the course of development.

For exactly the same reason one bird lays 20 to 22 eggs per month for 10 to 12 months, while another will lay 12 to 15 per month for nine or ten months. Fundamentally, the thing responsible for early maturity, good intensity, lack of pauses, and great persistency is the presence of certain genes and the absence of others. Eye color, body shape, feather length and width, size of bird, shape of egg, rapid molt, etc., are all tied up with the genetic constitution of the fowl.

By very careful selection for such factors as early maturity and late molt, we tend to fix the tendency and eventually get a flock of birds that are fairly uniform in regard

to these two factors. It is well to remember that one of the fundamental laws of nature is variation, and that therefore one must keep selecting the best and eliminating the poorest. Only the factors selected for will become uniform. Let us consider egg shape, for example. If we set nothing but well-shaped eggs for hatching, in four or five years the shape becomes well fixed. The color of the shell may be unsatisfactory and hatchability poor because we have paid no attention to either factor, and have used the poor qualities as well as the good ones.

So far we have listed three factors necessary for high egg production, namely: intensity, lack of pauses, and persistency. These are not the only considerations. There are others that should be mentioned. A bird must inherit enough vitality to carry her through the strain incident to laying intensely and persistently. This is a highly important matter, and depends just as much on those little genes as does eye color or plumage color. Some birds inherit the vitality but do not have the urge to lay. Others inherit the urge to lay but do not have the vitality to carry them along.

MANAGEMENT FACTORS

Another large problem is management—from the time the egg is laid until the layer's record is complete. This includes such factors as care of the egg before hatching, incubation, brooding, rations, methods of feeding, and housing. Without proper management birds of the very best breeding become culls. Too often high-class stock is purchased with the feeling that the breeding is so good that the birds will lay regardless of management. Frequently the management will not be as good as if a cheaper grade of stock had been purchased, the reasoning being that the birds are not of extra good breeding, and will, therefore, require very good management in order to return a profit.

Another factor that should be mentioned is disease. Pullorum disease is responsible for poor egg records from some hens in a well-bred, properly managed flock. The ovaries become badly diseased and prevent eggs from forming in normal clusters or cycles, thus reducing the intensity of laying. Mortalities are materially increased in Pullorum-infected flocks. Other diseases, such as roup and bronchitis, affect some birds more than others and materially reduce the number of eggs.

The time of year the birds are hatched may to some extent determine the number of eggs laid. June-hatched pullets, even if properly brooded and raised on clean range,

are materially handicapped for making first-year records. If hatched June 15th, they are not six months old until December 15th. Cold, changeable weather may prevent production until the middle of January or the first of February. One cannot expect any considerable number to continue to lay later than the first of October the following fall. This makes an eight-months laying period. If 18 eggs are laid each month, the average could be only 144 eggs per bird. On the other hand, if the pullets were hatched February 1st, production, in the case of light breeds, should be good by August 1st. These birds can be kept in production for three or four months and will produce an average of 50 eggs per bird before undergoing a partial molt. The flock will be practically out of production from November 15th to January 15th, at which time they should again be producing well. If they continue at a rate of 60 per cent from January 15th until October 1st, they will produce 153 eggs. This added to the 50 produced in the fall gives 203 eggs per bird during the pullet year as compared with 144 for pullets hatched June 15th. The pullets hatched February 1st must be fed four months longer at an extra cost of not over 50 cents and will produce 59 more eggs, which, if sold at 24 cents a dozen, will return $1.18, or a net difference of 68 cents per pullet. Each early-hatched cockerel is worth from 10 to 20 cents more than each late-hatched one, thus adding at least 10 cents to the 68 cents favorable to the early-hatched bird. If one were housing 1,000 pullets, this would make a net income of $780.00 for the year more for the February hatch than for the June hatch.

SUMMARY OF FACTORS FOR GOOD EGG PRODUCTION

1 Genetical Factors.
- (a) Intensity—genes that cause eggs to come in cycles of three or more.
- (b) Good rhythm.
- (c) Persistency—genes that cause the urge to lay to continue twelve or more consecutive months.
- (d) Early maturity.
- (e) Vitality enough to continue at a high speed for a long period of time.
- (f) Vigor enough to eat and assimilate large amounts of food.
- (g) No pauses such as the winter pause and those caused by broodiness.

2 Management Factors.
- (a) Hatching and raising young stock.
- (b) Nature of feed.
- (c) Feeding practices.
- (d) Housing.
- (e) Disease control.

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