TRANSMISSION OF DAIRY QUALITIES BY THE SIRE.

C. H. ECKLES, Professor Dairy Husbandry, University of Missouri.

It has long been an axiom of the breeder that the sire is half the herd, and it is generally accepted as a fit expression of an important rule.

The skillful breeder of any kind of stock does not need to have it pointed out to him how important it is that the sire be properly selected. If he is a skillful breeder, it is largely because he realizes the importance of the sire and knows how to select him. While the skilled breeder realizes the importance of this in breeding, the average dairymen does not give the question of the selection of the sire one-tenth the attention the importance of the question demands.

Thousands of men make use of a scrub or grade sire on account of mistaken economy in cost rather than pay a few dollars more for an animal that is almost certain to transmit desirable qualities. It is not surprising that we have so many worthless cows. They come by their worthlessness in the majority of the cases from sires worse than worthless. Some of these scrub bulls are registered in the herd books.

The most forcible means I have at hand to illustrate the remarkable difference in sires is to show some results from our own herd. In 1884 the Missouri Agricultural College bought four registered Jersey cows and the entire herd we have on hand today is descended from these cows. Of course, herd bulls have been purchased from outside but no female has been bought. Since 1892 complete milk and butterfat records have been kept of every cow. Up until 1901 practically every female was retained in the herd regardless of her dairy qualities. These conditions give an opportunity to study the effect of sires which can hardly be duplicated anywhere.

The first bull used was Missouri Rioter 19400, a son of Bachelor of St. Lambert. There is no record indicating the dairy quality of his dam. In fact his sire is the only animal in his pedigree known to be a strong breeder. This bull was a very
weak breeder as is shown in the chart. His daughters averaged 4,336 pounds of milk per year while their dams averaged 5,380 pounds. A decline on the average of 1,044 pounds of milk per year each. The average yearly fat production of the dam was 234 pounds, while the daughters averaged only 216 pounds. A decline of 18 pounds per cow annually from the dams to the daughters.

The income from ten daughters, counting milk at six cents per quart, fell $313.20 per year behind the dams. Counting fat at 25 cents the loss was $45.00. As long as this bull remained in the herd it was going backward in production instead of ahead. Suppose the herd had had thirty daughters of such a bull. Each year we would have been $135.00 behind what the dams produced, counting fat at 25 cents. If these cows were milked six years each, the total loss would be $820.00. This sum would buy several good bulls.

**RECORDS OF TEN DAUGHTERS OF MISSOURI RIOTER AND THEIR DAMS**

<table>
<thead>
<tr>
<th>Average Yearly Milk Production in Pounds</th>
<th>Dams: 5380</th>
<th>Daughters: 4336</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Percent of Fat</td>
<td>Dams: 4.41</td>
<td>Daughters: 4.97</td>
</tr>
<tr>
<td>Average Yearly Fat Production in Pounds</td>
<td>Dams: 234</td>
<td>Daughters: 216</td>
</tr>
</tbody>
</table>

**Decrease per Year for Ten Daughters Below Dams.**

1. Milk 10,440 lbs.
2. Fat 180 lbs.
3. Income [Milk, $3,320; Fat, $5,000]

The next bull used in this herd was Hugorotus 34447. This was a cheap bull without many tested animals in his pedigree. His mother, however, is said to have been a good cow. The daughters of this bull were inferior to their dams in milk production but on account of a higher per cent of fat they gained slightly in fat production.
It will be seen in the chart that the ten daughters fell a total of 3,770 pounds of milk per year behind their dams but gained 100 pounds of fat. The general results of using this bull were disastrous. In fact, the poorest animals ever in the herd were his offspring. The averages shown are made as good as they are only by the fact that two full sisters sired by this bull through some "nick," proved first class animals.

When this herd was culled on milk records alone, nine out of the eleven daughters of this bull then in the herd were sold to the butcher. The two remaining were the full sisters mentioned. As long as this bull was in the herd, the general tendency was backward.

**RECORDS OF TEN DAUGHTERS OF HUGOROTOS AND THEIR DAMS**

<table>
<thead>
<tr>
<th>AVERAGE YEARLY MILK PRODUCTION IN POUNDS</th>
<th>DAMS 4953</th>
<th>DAUGHTERS 4576</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVERAGE PERCENT OF FAT</td>
<td>DAMS 4.78</td>
<td>DAUGHTERS 5.49</td>
</tr>
<tr>
<td>AVERAGE YEARLY FAT PRODUCTION IN POUNDS</td>
<td>DAMS 231</td>
<td>DAUGHTERS 241</td>
</tr>
</tbody>
</table>

**DECREASE PER YEAR FOR TEN DAUGHTERS BELOW**

| DAMS | 1 MILK 3770 LBS. | 2 FAT (INCREASE) 100 LBS. | 3 INCOME MILK 6 CENTS, $1.12 | FAT (INCREASE) 25 CENTS, $1.25 |

The next bull at the head of the herd was Lorne of Meridale 34024. This bull had a splendid pedigree from the standpoint of records and his offspring show the results. His daughters, with one exception, were all superior to the dams.

The chart shows that the average milk production was raised from 4,542 pounds per year to 5,751 pounds; the fat production from 220 to 280 pounds per year. At butterfat prices the ten daughters of Lorne of Meridale returned each year $150.00 more than their dams. What a difference from the results from Missouri Riter.
If we had milked thirty daughters of this bull six years each, their product would have exceeded their dams in value $2,700.00; while the daughters of Missouri Rioter went $939.00 behind, or a difference in thirty cows in six years of $4,639.00 in actual income.

What would be the value of Lorne of Meridale in a large herd? We cannot say, but I am convinced that as a business proposition an owner of a large herd could better pay $1,000.00 for him than accept Missouri Rioter as a gift. Yet if he had been offered for sale when mature, the chances are that instead of bringing what he was worth, he would have brought little more than a bull beef price.

### RECORDS OF TEN DAUGHTERS OF LORNE OF MERIDALE AND THEIR DAMS

| AVERAGE YEARLY MILK PRODUCTION IN POUNDS | DAMS  | 4542 |
| AVERAGE PERCENT OF FAT | DAMS  | 490  |
| AVERAGE YEARLY FAT PRODUCTION IN POUNDS | DAMS  | 220  |
| INCREASE PER YEAR FOR TEN DAUGHTERS OVER DAMS | MILK  | 12090 LBS |
|                                            | FAT   | 600 LBS  |
|                                            | INCOME | $36270 |
|                                            |        | FAT, 25CT.LB $150.00 |

The next herd bull was Missouri Rioter 3rd 34587. This bull was the son of Missouri Rioter and was the only good thing this latter sire left in the herd. The remarkable qualities of Missouri Rioter 2nd may come in part from his dam which was the best cow in the herd up to that time and like the sire the daughter of Bachelor of St. Lambert.

The best cows ever in our herd were sired by Missouri Rioter 3rd. From dams with average records of 4,609 pounds of milk he sired daughters whose record; average 7,154 pounds. The
dams averaged 238 pounds of fat per year and the daughters raised this to 348 pounds.

The daughters of this bull produced $275.00 worth of fat per year more than their dams. Counting this on the same basis as before, thirty cows for six years, we have $4,950.00 worth of butterfat produced by the daughters in excess of that produced by the dams. What would be the value of this bull had he been owned by an association of neighboring dairymen where he might have had one hundred daughters or more? This bull was raised on the College farm and, as is often the case, because he was a home product, instead of coming from a distant State, he was not counted of any special value and was sold from the herd without any record even being made as to his purchaser, and he was never transferred. His remarkable breeding value was recognized when it was too late, and now we would like the chance of giving $1,000.00 to have him back.

**RECORDS OF TEN DAUGHTERS OF MISSOURI RIOTER 3\textsuperscript{rd} AND THEIR DAMS.**

| AVERAGE YEARLY MILK PRODUCTION IN POUNDS. | DAMS | 4609 |
| AVERAGE PERCENT OF FAT. | DAMS | 517 |
| AVERAGE YEARLY FAT PRODUCTION IN POUNDS. | DAMS | 238 |
| INCREASE PER YEAR FOR TEN DAUGHTERS ABOVE DAMS. | 1 MILK | 25450 LBS. |
| | 2 FAT | 1100 LBS. |
| | 3 INCOME | MILK, 6 CT. LBS. $763.50 |
| | | FAT, 25 CT. LBS. $275.00 |

Minette’s Pedro 50031 is the last herd bull with a sufficient number of daughters to give figures of any value. It may be observed that the herd remained practically at a standstill while he was at its head. In general this bull was not a very potent bull since we have wide variations and a lack of uniform-
ity in his offspring. Among them are some excellent cows and some worthless. From the good dams we secured good daughters; from inferior dams the same quality of daughters.

RECORDS OF
TEN DAUGHTERS OF MINETTE'S PEDRO
AND THEIR DAMS

<table>
<thead>
<tr>
<th>AVERAGE YEARLY MILK PRODUCTION IN POUNDS</th>
<th>DAMS</th>
<th>DAUGHTERS</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>4965</td>
<td>5093</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AVERAGE PERCENT OF FAT</th>
<th>DAMS</th>
<th>DAUGHTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.97</td>
<td>5.02</td>
</tr>
</tbody>
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<table>
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<th>AVERAGE YEARLY FAT PRODUCTION IN POUNDS</th>
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<th>DAUGHTERS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>249</td>
<td>254</td>
</tr>
</tbody>
</table>

INCREASE PER YEAR FOR
TEN DAUGHTERS OF
MINETTE'S PEDRO OVER
MILK 1280 LBS.
DAMS.

2 FAT 50 LBS.
3 INCOME MILK $38.40
FAT. 25 CT. LBS. $12.50

These figures show the immense difference in the way dairy qualities are transmitted even where all are pure bred animals. The selection of a herd bull is a very serious matter for the man who is trying to build up his herd and the higher developed they are in the way of dairy production, the more serious is the problem.

In the beginning the old axiom was repeated that the sire is half the herd. By using the figures given it can be easily proved that this statement is not only true but in some cases at least should be made still stronger. Suppose we take the records of the daughters of Lorne of Meridale. This animal sired twelve cows in the herd that gave an income of $17.48 per year over their dams, counting butterfat at 25 cents per pound.

If this bull had been at the head of a grade herd of 20 cows for five years, we would have had something like the following result:

We could count on possibly 90 calves being dropped in that time of which 45 would be heifers. Of these, 40 should be matured and come into milk. At the average increase in income of
the twelve daughters of Lorne in the Missouri Agricultural College herd, namely, $17.48 per year, these 40 heifers would produce $699.20 income per year above their dams.

If they were in milk six years each, the total income would be $4,195.20 above that of their dams; an increase which can be reasonably credited to the influence of the sire. The original 20 grade cows would be valued possibly at $1,500. This sire would be worth in a herd of this size over $800 per year, or half the value of the herd every year.

A similar calculation could be made showing the enormous loss that would have resulted from using Missouri Riator in a herd of equal size.

It should be noted that this is assuming the improvement in the production of grade cows by using such a sire would be no greater than was the actual case where the dams were already pure bred. We all know if the dams had been grades of inferior breeding, the results would have been still more marked.

A Missouri farmer gives me the following interesting figures showing the effect in milk production of a dairy sire as compared with one not of dairy breeding. He owned a western bred grade cow. Her first heifer was sired by a grade beef bred sire, her second by a pure bred Jersey. The mother averaged 3,085 pounds of milk and 117 pounds of fat per year. The daughter by the grade beef bred sire averaged 3,700 pounds of milk and 133 pounds of fat. The daughter by the Jersey averaged 6,000 pounds of milk and 240 pounds of fat. Counting fat at 25 cents per pound, the income of the dam was $34.19 per year, that of the daughter by the grade beef bred sire $38.85, and that by the dairy bred $70.00.

In a herd of 30 cows, if such results be secured on the average the income per year for the daughters, if by the dairy sire, would be $960 per year more than the income from a like number by the grade beef sire.

What would be the difference in value of these two bulls for the dairy farmer with 20 or 30 cows?

One of the chief difficulties in selecting the sire is that practically nothing can be predicted from the looks of the animal, if he has the inherent characteristics of transmitting good dairy qualities or not. Who will undertake to judge by the appearance of a bull if he is one that will transmit dairy qualities as
did Missouri Rioter 3rd or whether he is as worthless as Hugo-
rotus?

The man who will discover some means of so judging will con-
er a benefit on breeders that can scarcely be estimated.

There are two principles that are especially concerned with
breeding, and should be kept in mind. The first is that "like
produces like," and the second is the law of "natural vari-
ations."

The cow in the condition that nature made her undoubtedly
produced only milk enough to feed the calf for a few months
until it could subsist on other feeds. This milking character-
istic was transmitted quite regularly. It was a case where like
generally produced like but some cows even then were undoubt-
edly better milkers, due to the law of natural variation. The
principle of selection did not come in to retain this variation,
and no improvement in this characteristic was made.

After cattle was domesticated the same conditions existed but
finally man began taking advantage of the natural variations
and began saving breeding stock from those having the charac-
teristics such as greater milk production which he found to be
valuable.

The animal which is different from the others of its kind by
natural variation will reproduce this characteristic in a certain
proportion of its descendants. If this same natural variation
is in the ancestry of both parent, the chance of transmission is
much greater but under any circumstances only a part of the
progeny will have the new characteristic.

The dairy cow of today is largely an artificial product, or
perhaps it would be better to say she is an abnormality, since
her mammary glands have been abnormally developed by taking
advantage of the law of natural variation. The rule of "like
produces like," is only true to a limited extent and the farther
we get away from the original type in breeding the smaller the
proportion of cases where it holds good. This accounts for the
fact often observed that the offspring of a phenomenal cow are
often disappointing. However, it will be found that on the
average there will be more good animals among the offspring of
such a cow than among those from a cow of moderate, or low
dairy capacity. We must always expect to find inferior animals
appearing frequently in all herds. No breeder can prevent it,
but no good breeder fails to reject the inferior ones promptly
when discovered. The higher developed we get our cows, the more difficulty we must expect in keeping them all up to standard.

In selecting a bull for a mixed herd or one of a low dairy capacity any well bred bull of a dairy breed with good producing individuals behind him is certain to benefit the herd. Even for the grade herd, the exceptional bull that will transmit qualities higher than the average of his breed is worth more than two or three inferior ones.

There are two courses open to the man selecting a herd bull: One is to buy a young bull on the strength of the records of his ancestors and trust to luck to a certain extent that he will be one that will transmit the desirable characteristics of his ancestors to a high degree. As a rule, such a bull will do fairly well at least in transmitting these characteristics. For the owner of grade cattle or herds of low dairy capacity, this method of selection does very well.

In selecting a young bull the pedigree including the record of ancestors is of as much or more importance than the individuality of the animal. The things to be looked for in the pedigree are, first of all, records of production by the dam of the animal, if you are breeding for milk production. If you are breeding for show animals, get a descendant of show animals.

There are some who refuse to have a bull from the phenomenal record making cows for fear the vitality of the calf will be weakened. I belong to the large majority who want the dam to have the highest record possible, other things being equal. I do not expect more than a few of her close descendants will inherit this high quality but the chances are better for them to average up well than they would be from a cow of lower productive capacity.

There is a general belief among breeders that the characteristics of the dam of the sire are transmitted stronger to his daughters than are the characteristics of any other single animal among the ancestors. How much there is in this belief I am not prepared to say.

Next in importance to the dams' records comes the records of the sires' daughters. If the bull has sired many high testing daughters it is a good evidence but not certain that his son will also transmit these characters. Third in importance comes the grand dams, and so on through the pedigree. The pedigree of
Cuerney Bull
Lorne of Meridale is a good example of a pedigree strong in records and having every indication a pedigree can show that these characters will be transmitted as proved to be the case. The pedigree of Hugorotus shows only three tested cows of which only one is as close as the third generation. The judgment that would be passed upon these two bulls from a study of their pedigrees would be the same as was the results in actual trial. It must not be expected, however, that the pedigree will always be as accurate an index of the value of the animal as it is in this case.

It should be kept in mind always that it is much more important to have a good animal for parent than a noted animal back in the third or fourth generation. I frequently hear men speak of having a Golden Lad, a Stoke Pogis or a DeKol bull, and when you examine the pedigree the animal mentioned is found in the third or fourth generation, which means they consider the most important fact about the bull to be the 61/4 or 121/2 per cent of the blood of the noted bull he may carry. The close ancestors are the ones that count.

Care should be taken to discriminate between official records and private records of milk and butter production, especially where the latter are churn tests that test the ability of the butter maker as much as the butter production of the cow. An official record means what it says and so do many private records but there is always an element of uncertainty about the latter that detracts from their value.

Much more attention should be given to yearly records than to those covering seven days. Of course there are other things to be taken into account in buying a young bull, but I believe the records of the ancestors are of first consideration. In buying a bull of any age of course we require an animal of good conformation, strong vitality and constitution and good breed characteristics. In buying a young bull I want one from a cow medium to large for the breed. She must have been a regular breeder and a cow of strong constitution and vitality. She must have a well developed, symmetrical udder and teats, and a large official year’s milk and butter test.

While most dairymen favor the selection of a young bull as a herd bull, there always is the uncertainty about how he will transmit the dairy characteristics. There is a more certain but more difficult way to get a bull that will transmit the desired
characteristics. This is to get an old tested bull, one who has sired daughters of merit and showed himself to be the exceptional animal wanted by every breeder.

The most skilled breeders are always on the lookout for such an animal but many are never discovered and many others only after it is too late. Whenever possible it is always advisable to retain an old bull until the results of his breeding can be ascertained. Then if not satisfactory, the sooner he is gone the better, but there is always a chance of finding a bull like Missouri Riotor 3rd, previously mentioned.

The wonderful prepotency of Stoke Pogis 3rd was not recognized until he had been sold for beef. Hengerveld DeKol, the great Holstein bull that recently died, on the other hand was retained until it was discovered that he was one of the great bulls of the breed and as a result was sold for $1,500.00 at nine years of age for breeding purposes.

One of the great unnecessary losses among the dairymen is the sacrifice of the bulls when they are mature and at their best. The average dairyman buys a young bull, uses him two or three years and offers him for sale without waiting to learn of the quality of his daughters. His neighbor instead of buying the old bull buys a young one and the older one that may be worth a fortune to the community is sold for beef while the neighbor is experimenting with the young one.

There is one danger connected with the aged bull that should be understood and guarded against. This is the introduction of contagious abortion. If I had a herd free from this disease, I would exert the greatest precaution about introducing an aged bull. If I was not entirely satisfied on this point I would select the young calf which is safe from abortion even if coming from a herd where the disease exists.

DISCUSSION.

Prof. Eckles: When you hear a man speaking of a dairy bull and what his ancestors did way back in third and fourth generations, you might ask him if he knows his own ancestors that far back, and you will find that very likely his doesn’t even know their names. The close ancestor is the one that counts, especially the first and second generation.

This question of the getting of a tested bull, one that had demonstrated his worth as a breeder, is coming to be of more
and more importance in breeding operations. I believe the time will come when in some way we will make systematic efforts to test animals before we use them in a valuable herd. We have recently adopted a plan that will enable us to keep track on our grade bulls. We are not going to sell our grade bulls in the future. They bring but very little money and we have adopted a plan of farming them out and keeping them for a number of years, until we find out what kind of daughters they have sired. We are not going to run a chance of losing such bulls as these two, as we have done in the past. If we have a good bull, we will have a string on him so we can get him back again. We don’t propose to lose track of him.

Mr. Cunningham: You speak of conformation and pedigree; which would you place the greater consideration on, or which do you consider the more valuable, the conformation of this sire or the pedigree behind him?

Prof. Eckles: In the case of the dairy animal, I would say without any hesitation the pedigree back of him, and by that I mean the record.

The Chairman: That is, the pedigree based on production.

Prof. Eckles: Yes, not necessarily who his grandsires were, but the records of production.

The Chairman: We will have to close this discussion.

The next topic is an address by Prof. H. C. Wing, of Cornell University, from our great dairy competitor, the State of New York. I now take pleasure in introducing to this audience Prof. Wing.

ADDRESS.

PROF. H. C. WING, Cornell University, N. Y.

Mr. President, Ladies and Gentlemen:—I am sure it is worth the journey from Ithaca, if nothing more occurred, than your wonderful yell. I noticed Col. Harris was brave enough to reply, but Prof. Eckles was not, and I shall follow in his footsteps. But if you really want to know what the Cornell yell is like, just get Dean Henry and Dr. Babeock off in a corner sometime, and they will let you know.

Some of you were perhaps at the meeting of the Guernsey Breeders yesterday afternoon and you will remember that what