have ranged from 110 to 168 lb., averaging 145 lb.

With the exception of two lighter weight calves, normal delivery has been possible. Four have been delivered by Caesarean section. Of these none has survived more than a few hours. All other calves were dismembered. As a result, the future reproductive capacity of these cows has been impaired greatly. During the ninth month of pregnancy, there appears to be a complete absence of all physical changes normally occurring.

Pedigree analyses indicate that all calves manifesting this anomaly are homozygous for an autosomal recessive gene. It is concluded tentatively that prolonged gestation is caused by an hormonal imbalance between the fetus and mother, when the fetus is of the mutant genotype. This unique genetic material should prove valuable for certain physiological studies.

P3 Estimation of Changes in Herd Environment. C. R. HENDERSON, Cornell University, Ithaca, N. Y.

Accurate appraisals of the results of breeding programs and most efficient estimates of breeding values of individuals whose own records and whose relatives' records were made in several different years require quantitative measures of the effects of changing herd environment. Least squares or modified least squares methods for obtaining such measures give biased estimates when records of cows culled from the herd are either above or below the herd average. This bias results from the lack of perfect repeatability of records. In contrast, the method of maximum likelihood automatically takes into account incomplete repeatability and annual culling levels and utilizes all of the records in such a way as to obtain the most precise estimates possible of the yearly environmental effects.

The maximum likelihood method has been utilized to obtain annual correction factors for several New York dairy herds. The method is illustrated with data from one of these herds and less accurate but less laborious modifications are described. Examples are given of the use of the correction factors for estimating the genetic improvement in the herd, predicting the breeding values of cows and evaluating sire proofs. Application of the method to computation of age correction factors also is discussed.

P4 The Number of Proved Sons Necessary to Evaluate the Transmitting Ability of a Sire. W. E. WASHBON AND W. J. TYLER, West Virginia University, Morgantown.

One hunderd seventy-four Holstein sires with eight or more D.H.I.A. proved sons were studied to determine the least number of proved sons necessary to estimate most accurately the performance of those to be proved later. The data included average butterfat production of the proved sons' daughters, average difference of daughters' production as compared to their dams and per cent of proved sons that maintained or increased butterfat production in the herds in which they were used. Averages of the first three to ten proved sons, respectively, were compared with averages of the following three, five and ten sons.

Highly significant correlations ($r = 0.35$ to 0.65) indicated that the average butterfat production of the daugthers of the first three proved sons was nearly as accurate as data on more sons in estimating the average butterfat production of the daughters of the next three, five or ten proved sons of a sire.

Similarly, the significant correlations ($r = 0.24$ to 0.40) for the sons' daughters' increase or decrease in butterfat production from their dams indicated that data on the first three or four proved sons were nearly as accurate as data on a larger number in predicting what might be expected from the next three, five or ten proved sons in this respect.

For per cent of sons improving production the correlations were significant when the first four, five and six sons were compared with the next ten sons ($r = 0.30$).

A sire's future granddaughters' butterfat production and its difference from their dams' production apparently can be estimated nearly as well from the performance of the first three or four sons as from a larger number. The per cent of a sire's future proved sons that likely will improve production is more reliable if the prediction is based upon the performance of at least the first four or five proved sons.

P5 Calf Mortality, Sex Ratio and Incidence of Twinning in Two University of Minnesota Herds. K. MILLER AND L. GILMORE, Minn. Agr. Expt. Station, St. Paul.

The University calf records at Grand Rapids and St. Paul have been analyzed with respect to prenatal and postnatal mortality for the first 6 mo. and for other information such as the sex ratio and incidence of multiple births.

At University Farm for the 12 years 1934 to 1945, inclusive, 50 of the 592 births, among Guernseys, Holstein-Fresians and Jerseys, were born dead. Ninty-one died during the first month, 36 more by the end of the sixth month