trated as the original solution. The amounts of urine from the upper and lower halves ran fairly uniformly—*e. g.*, from one frog being 0.23 cc. for the upper portion and 0.26 cc. for the lower portion.

These kidneys removed after the experimental procedure, fixed, sectioned, and stained with eosin, showed (1) grossly, a kidney fairly uniformly injected with ink, and (2) microscopically, a fair degree of uniformity of tubular capillary injection and glomerular injections of upper and lower halves as follows: in the upper portion of the kidney from 4 to 32 per cent of the glomeruli were injected with an average of 14.3 per cent, whereas in the lower portion, from 17.5 to 97.5 per cent were injected, with an average of 43.1 per cent.

In the light of these findings, the burden of proof in the question as to whether the dye is excreted by way of the glomeruli or by way of the tubules, lies with those who claim that it is excreted by way of the tubules.

SUMMARY.

When a dye solution is run into the frog's kidney in such a way that, in the lower portion of the kidney, it runs into tubular capillaries and into a large number of glomerular capillaries, while in the upper portion of the kidney it runs into tubular capillaries, and into only a few glomerular capillaries, the amount of dye excreted follows the number of active glomeruli receiving dye solution, although both halves of the kidney are producing urine.

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On correlation between age of parents and length and weight of the newborn infant.

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It seems reasonable to assume that a number of factors influence the size of the human individual at various stages of

*These investigations were begun while the writer was a member of the staff of the Station for Experimental Evolution and their completion has been facilitated by a research grant from the Carnegie Institution of Washington.

development. Pearson and his co-workers have shown the great importance of hereditary factors. They have found that in general such environmental factors as they have been able to consider play a much smaller rôle in determining the characteristics of the individual. Nevertheless it seems important to investigate all such factors in as great detail as possible, with a view to disentangling those factors which are innate in the zygote from which the individual develops from those which are extrinsic to the individual, and to measuring quantitatively the relative importance of each. It seems especially desirable to consider certain morphogenetic factors.

The purpose of this paper, which is one of a series dealing with the physical characteristics of the newborn infant of various races, is to consider the possible relationships between the age of the parents and the length and weight of the newborn child.

The data represent measurements on infants of the white race taken at the Sloane Hospital for Women, New York City, and recorded in the archives of the Obstetric Divisions of that institution. For opportunity of using these records we are indebted to the late Dr. W. E. Studdiford, who was Superintendent at the time this phase of the investigation was undertaken.†

Since it is possible that the average age of parents and the average dimensions of the newborn infant differ from nationality to nationality, we have considered separately the characteristics of infants born of Austrian, English, German, Irish, Italian and Russian parents. Both parents were born in the countries designated. By the examination of about 44,000 records assembled over a period of about 30 years (September, 1890, to September, 1921), it was possible to secure the following numbers of measurements of length and weight.

	Male	Female
Austrian	117	136
English	170	158
German	443	402
Irish	1138	1071
Italian	126	123
Russian	324	301

† This work was begun with Dr. C. C. Little, who was forced to give up personal cooperation at an early stage due to the pressure of administrative duties at the University of Maine and subsequently at the University of Michigan.

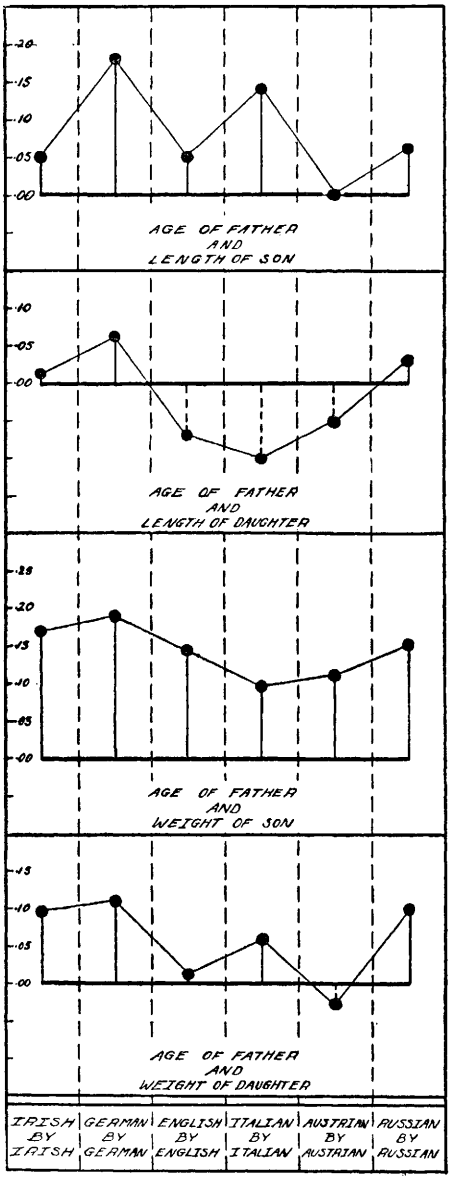

DIAGRAM 1.

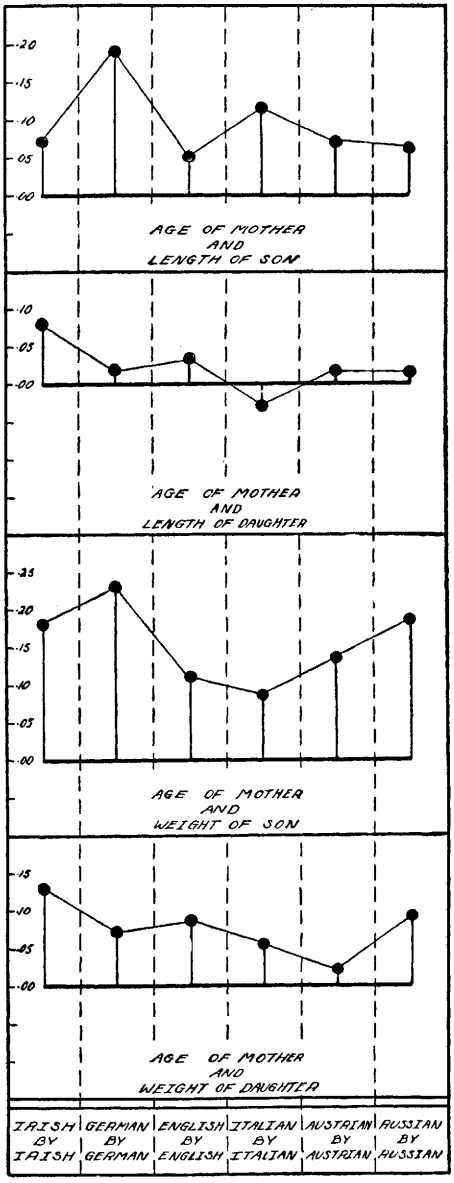

DIAGRAM 2.

The interrelationship between the age of the parents and the length and weight of the infant has been expressed in terms of the correlation coefficient. For present purposes a graphic method of presenting the constants is sufficient. They will be given in full and considered in relation to their probable errors in a more extended publication. In Diagram 1, for the relationship between age of the father and the length and weight of the son and daughter, and in Diagram 2 for the relationship between the age of the mother and the length and weight of the son and daughter, the heavy transverse bars in the four panels denote the position of zero correlation as shown on the scale of ordinates.

Considering first the relationship between the age of the father and the characteristics of the infant, we may note that all of the correlations between age of father and length of son are positive and that 5 are larger than 0.05. In the case of the relationship between the age of the father and the length of the daughter 3 of the coefficients are positive while 3 are negative in sign. All are of a very low order of magnitude. We may not, therefore, conclude that there is any very intimate relationship between the age of the father and the length of the child.

All of the coefficients indicate that the relationship between the age of the father and the weight of the son is positive and of the order +0.10 or higher. The coefficients measuring the relationship between age of the father and the weight of the daughter are positive in 5 of the 6 series.

While these coefficients are generally low, they are prevailingly positive in sign. Taking all of the relationships together, 20 of the 24 coefficients are positive as compared with 4 which are negative. On the average the positive coefficients are larger than those which are negative. This furnishes evidence for the existence of a *slight* positive correlation between the age of the father at the time of the birth of the child and its physical dimensions.

The average values of the coefficients for the six series are:

Age of father and length of son, $\overline{r} = +.0828$

Age of father and length of daughter, $\overline{r} = -.0187$

Age of father and weight of son, $\overline{r} = +.1464$

Age of father and weight of daughter, $\overline{r} = +.0591$

The negative value is sensibly zero. The others are low order positive values.

Turning to the relationships for the mother, we note that all of the correlations between the age of the mother and the length and weight of son are positive. Most of them are of the order 0.10 or higher. The coefficients measuring the relationship between the age of the mother and the length and weight of the daughter are positive in 11 of the 12 series. Taking the data as a whole, it appears that 23 of the coefficients are positive as against 1 which is negative.

The average values of the correlation coefficients measuring the relationship between the age of the mother and the characteristics (length and weight) of her child are:

Age of mother and length of son,	$\bar{r} = +.0948$
Age of mother and length of daughter,	$\bar{r} = +.0245$
Age of mother and weight of son,	$\bar{r} = +.1563$
Age of mother and weight of daughter,	$\bar{r} = +.0776$

While these values are very low, the consistency of the results can leave little ground for doubting the conclusion that there is a definite relationship between the age of the mother and the length and weight of her newborn infant. The averages are slightly higher than those for age of father.

The indications of a positive correlation between the age of the father and the characteristics of the infant should not lead to the conclusion that there is any direct morphogenetic relationship between the age of the father as such and the length and weight of the child. The ages of father and mother are closely correlated. Thus if there be any definite relationship between the age of either of the parents and the characteristics of the child there should be some correlation between the age of the other parent and the dimensions of the child due solely to the age correlation of the parents themselves.

Neither can we conclude that there is a direct causal relationship between the age of the mother and the characteristics of the child. In a subsequent paper it will be shown that there are positive correlations between birth order and pregnancy order and the measurements on the infant. Both birth order and pregnancy order are themselves intimately correlated variables and both are closely though less highly correlated with the age of the mother.