

The lowest foetal heart-beat in my series was 98, in a very large male child. From this series of observations, it seems tolerably conclusive that a foetal heart-beat under 130 is generally diagnostic of a male; over 140, a female. To secure accuracy, the following precautions should be taken:

1. Observations should be made before or in the very early stages of labor, for as labor advances the foetal heart-beat tends to become more rapid or irregular.

2. Several observations should be made, and their mean calculated, for the painless contractions of the uterus frequently modify the foetal heart-beat 10-20 per minute.

Many failures in diagnosis may be referred to lack of attention to these precautions.

In discussing this question of sex, much confusion has arisen from the want of clear notions respecting menstruation, ovulation and conception. Menstrual flow and the discharge of a mature ovum from a Graafian follicle are supposed to occur about the same time; hence many conclude that these two processes stand in the relation of cause and effect. Although the question is not yet definitely settled, evidence is rapidly accumulating to prove that their coincidence is accidental rather than necessary, and that one process may go on independently of the other. Indeed they are essentially opposite in character: ovulation is *progressive*, being the preparation and discharge of ova fit for impregnation; menstruation is *retrogressive*, being essentially a retrograde metamorphosis of the soft decidua prepared for a previous ovum. It has, therefore, been aptly called "the funeral obsequies of defunct and disappointed ova."

Physiologists tell us that after a ripe ovum has been expelled from its Graafian follicle, its germinal vesicle becomes nuclear and approaches the surface. A portion is eventually extruded from the egg in the form of the Polar Bodies, leaving the remainder to form the *female pronucleus*. The ovum then ceases to grow unless speedily fertilized, perishes, and is cast off. But if spermatozoa reach it in time and penetrate its substance, it does not perish; the heads of the spermatozoa detach themselves and become *male pronuclei*, which fuses with the female pronucleus to form the fertilized nucleus. Conception is said to have taken place and growth is thenceforth rapid. Morphologically the male and female pronuclei are closely allied,

both being derived from the primitive ova of early embryonic life. In the female, a primitive ovum develops into a permanent ovum, capable of producing a human being; in the male, a primitive ovum breaks up into a number of spermatozoa. That the sex of offspring must be due to the relative properties and powers of these male and female pronuclei is tolerably clear, but to what properties or what powers is not quite evident. The essential points of Starkweather's theory are the following:

1. The male and female element share equally in the determination of sex.

2. Sex is determined by the superior potentiality of one or the other.

3. The superior parent or element (at the time of fruitful intercourse) determines the opposite sex in the offspring--cross-heritage, as it has been called.

4. In the great majority of cases, it is possible to prognosticate the sex that will result from the union of certain parents.

5. The sex of offspring is or might be generally within the control of parents.

6. This law holds good for the lower animals as man.

He cites numerous life histories in support of his theory, such as Milton, Shakespeare and Sir Thomas More, and dwells upon the well-known fact that great men have usually great mothers. He holds that his theory accounts for the small excess of male births among western nations, the marked excess of females among mulattoes, and the temporary large excess of males after war, pestilence, etc. In certain families, too, there has been noticed a remarkable succession of sons in one generation, of daughters in the next, and of sons again in the next. These cases are explained as examples of cross-heritage, the sex being determined by the superior opposites. In the controversy aroused by Starkweather's book, frequent appeals have been made to the experience of stock-breeders, both for and against his theory. On the whole, the evidence seems to be against the ability of man to control sex among the lower animals. Yorkshire men, the most experienced breeders in England, and probably in the whole world, have no confidence in their power of predetermining the sex of horses and cattle although it would be very much to their pecuniary advantage to be able to do so, but are confident that they can modify, develop, or eliminate any other physical quality to an almost unlimited extent.