132. *Probability-theoretic Investigations on Inheritance. IV$_5$. Mother-Child Combinations.*

(Further Continuation.)

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5. Mother-child-child combination.

The object of the discussions done in § 3 of IV concerned, as stated there explicitly, two children belonging to the same family and their mother, namely two children having both parents in common and their mother. Besides mother-children combinations of this sort, there is an another sort of combinations consisting of a mother and of her two children not having a father in common. Such a combination will occur, for instance, when a mother who was divorced by or separated by death from her former husband has married again bringing a child and then produces a new child with her present husband. In the present section we shall consider *mother-child-child combinations* of this sort.

We treat rather generally, as in § 2 of IV, the case of mixed combinations. Let a mother belong, as usual, to a population with distribution $\{p_i\}$, and let fathers of the first and second children to populations with distributions $\{p'_i\}$ and $\{p''_i\}$, respectively. In particular, if

$$p_i = p''_i \qquad (i = 1, \ldots, m) \tag{5.1}$$

or if

$$p'_i = p_i \qquad (i = 1, \ldots, m), \tag{5.2}$$

the results reduce to those in case where both fathers or the father of the first child and the mother belong to the same population, respectively, and if further

$$p'_i = p''_i = p_i \qquad (i = 1, \ldots, m), \tag{5.3}$$

then the reduced case appears where both fathers belong all to the same population as the mother.

Now, let the probability of mother-child combination consisting of a mother A_{ij} and her first child A_{hk} be denoted by