

25. *Probability-theoretic Investigations on Inheritance.* VII₁. *Non-Paternity Problems.*¹⁾

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1. Preliminaries and notations.

In conformity with a principle of Mendelian inheritance, any gene contained in neither of parents' types can never appear in a type of their child. That is to say, any gene appearing in a type of child must necessarily be contained in at least one type of its parents. Moreover, any gene contained in a type of a parent can appear in a type of child, and the passage of each gene takes place equally probably. Various results established have always been based upon this assumption. For instance, the table listed in § 3 of I represents such circumstances very well.

In view of the principle, if a child has a gene not contained in type of its mother, then the gene must surely originate from its father, so that it then becomes possible to conclude the non-paternity of a putative father as being not a true father. This is the reason why inheritance phenomena, especially those of human blood types the inheritance modes of which have been quite clarified, can be and have really been applied to establish non-paternity, from medico-legal standpoint, in cases of bastardization.

It is of much practical importance whether recessive genes are existent or not. If there exists a recessive gene, an individual representing a dominant character can be, besides of homozygote, also of heterozygote. Hence, for instance, in case of pair of a mother and her child having the same dominant character in common, if their types are both known to be of homozygote, a man having the corresponding recessive character would be proved to be not a true father. But, such a decision is possible only upon genotypes but impossible upon only phenotypes, since there exists another possibility of the same triple on phenotypes; namely, the possibility of

1) Y. Komatu, Probability-theoretic investigations on inheritance. I. Distribution of genes; II. Cross-breeding phenomena; III. Further discussions on cross-breeding; IV. Mother-child combinations; V. Brethren-combinations; VI. Rate of danger in random blood transfusion. *Proc. Jap. Acad.* **27** (1951), I: 371-377; II: 378-383, 384-387; III: 459-465, 466-471, 472-477, 478-483; IV: 587-592, 593-597, 598-603, 605-610, 611-614, 615-620; V; **28** (1952), VI: 54-58. These will be referred to as I, II, III, IV, V, VI.