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GENETIC MALFORMATIONS AND ANOMALIES WITHIN  
THE ARISTOTELIAN THEORY OF REPRODUCTION

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SUMMARY

*This paper aims at examining the way in which Aristotle deals with the problem of genetic malformations, developed, in particular, in The Generation of Animals (Book IV), within the theory of the genetic inheritance. According to this doctrine a malformation represents a deviation from the teleological development of the reproductive process, whose first step is represented by a female birth. Even though necessary for the continuation of the species, this event is described within the same theoretical frame of the genetic anomalies by Aristotle, who is committed to provide some prescriptions about mating and reproduction, in order to prevent this departure. In general, the issue of malformations highlights the presence of the material and mechanical aspect of the nature which, at times, can support or obstruct its teleological design, but which constitutes one of the fundamental assumptions of the physis.*

In book II of the *De An.*, after the preliminary defining discourse, Aristotle examines the different faculties of the psyche, from the more basic ones, shared by all the natural organisms, to the more complex ones.

The first and the most widely shared is the nutritive faculty, whose proper functions are generation and assimilation of food. In particular, reproduction is defined as the most natural of every function

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among living beings, for which they all strive: generating offspring to have a share of “the eternal and the divine<sup>1</sup>.”

This tendency belongs to every living being, except for malformed or spontaneously born creatures: they are excluded from the teleological process because they interrupt the achievement of the telos. They do not replicate in the same way the form of their parents, making impossible to establish a causal relation between parents and offspring. Monstrosities, according to Aristotle, will be failures in the purposive effort<sup>2</sup>.

The goal of my analysis is to study this problematic aspect of Aristotle’s theory on reproduction, through an examination of the problem of genetic malformations, because I consider it to be particularly explicative with regards to the relationship that exists in nature between a teleological based function and the presence of a necessary counterbalance in material necessity, in the Aristotelian view of nature<sup>3</sup>.

The majority of textual references are in the IV book of *De gen. anim.*, within the theory of inheritance of characters.

Before getting to the heart of the matter, I would like to quickly review the principles that regulate the process of transmitting characters, of which the teratas’ birth constitutes the last link, the final result. This is explained beginning with the same principles according to which reproduction comes about while better clarifying some assumptions. On the other hand, it also makes up one of the arguments in which one can grasp more clearly the complexity and impossibility to univocally read the relationship that connects matter and form, potentiality and actuality, female and male, in the Aristotelian biology.

According to the Aristotelian theory, the menstrual blood is concocted by the heat of the male semen that moves and “informs” the female material through the transmission of a series of impulses. These in turn transmit both the genus’ characteristics as well as the individual ones<sup>4</sup>.

When the menstrual blood is thoroughly concocted the process is completed satisfactorily and the movement coming from the father prevails guaranteeing a birth that reproduces the paternal form.

However, it is possible that the concocting remains incomplete, the impulse becomes overwhelmed and a series of dispersions begin along the chain of resemblances. This resolution of movements is indicated by the verb *παρεκβαίνω*, and the verb used to describe the relationship between form and matter is *κατατέω*, also in the negative form, when the form cannot prevail.

It may occur in a gradual manner according to different levels. It may concern a conversion in the opposite direction, for example, a male in the female. Then a male may look like his mother and vice versa, and continuing down the paternal or maternal genealogical line, from the closest relatives to the most distant, according to a linear process (i.e. the male retraces the male lineage and the female retraces the female lineage) or a crisscrossed one<sup>5</sup>.

As it has often been highlighted, this movement happens thanks to a counter-push that matter exerts on the form. Just as a knife is dulled down by a surface, or a hot substance is cooled down by that which it is trying to warm, the male impulse undergoes a counter-effect by the matter<sup>6</sup>.

Many times it has been underlined how, within this process, an idea may emerge of matter that is no longer passive, but rather capable of carrying out an opposite movement with quite specific effects on the products of generation<sup>7</sup>. However, that which happens at the end of the inheritance chain, in my opinion, emphasizes this prospective even more and highlights its importance.

Thus, when the matter cannot be resolved the final result is birth defects.

The long dissertation on anomalies and defects involves various types of problems without a clear terminological distinction between what is a monstrosity and what is a deformity. This lack

of distinction is probably based on the basic assumption that the explanation of the two phenomena are related and implies a sort of interchangeable use of terms such as *teras* (which is the most frequent), *anaperia*, the plural of *peroma* (with reference to the malformed beings)<sup>8</sup>.

There are various types of terata (or malformations in general) groups. The first example of the anomaly, on a basic level, is the absence of any resemblance between parents and offspring.

Within this group of anomalies, Aristotle mentions one particular case: the birth of a female, which is not a reproduction of the form of the male parent and which derives from the first interruption of an ideal resemblance's chain between father and son.

If we consider the theory of the transmission of the characters as a line, progressing from an ideal starting point (the birth of a male taking after the father) towards an extreme point, passing through different levels of malformations, we could consider the interruption of the line of resemblances as an intermediate point.

Then, if the only real parent is the male, the only one who contributes whit fertile semen to the reproductive process, it will clearly appear the reason why a female birth is regarded as an anomaly, insofar as it is not a perfect reproduction of the form of the male parent, but just in a deformed way.

Nonetheless, this kind of anomaly involves half of the living beings and it is necessary for the sake of reproduction and, consequently, for the sake of the survival of the species<sup>9</sup>.

Yet, in order not to waist the semen and to facilitate male births, Aristotle provides some prescriptions in the *Politics*, where he observes how lawmakers must worry about legislating in a procreative fashion. In book VII (16 1334 b 29-34) a joint criticism over excessive precocity in matrimonial union and, consequently, conceptions, recurs - couples who are too young will produce small and imperfect children with a tendency to be of the feminine sex:

*The union of male and female when too young is bad for the procreation of children; in all other animals the offspring of the young are small and undeveloped, and with a tendency to produce female children, and therefore also in man, as is proved by the fact that in those cities in which men and women are accustomed to marry young, the people are small and weak; in childbirth also younger women suffer more, and more of them die<sup>10</sup>.*

The optimal constitution expects marriage not to happen before 18 for girls and 37 for men.

As well as explicit reflections about the most adequate age for reproduction, the Philosopher also gives clear indications about the best season for copulation. In fact, the conjectural law-maker of Aristotle's imaginary state offers to the bride and groom that they carry out their sexual union in winter. This is an indication provided by physicians and natural philosophers, whose opinion has weight enough to make the prescription opportune and advisable, according to Aristotle<sup>11</sup>.

The exclusion of summer and the preference given to the winter months may lead to some considerations. In the *Hist. anim.* the philosopher asserts that women have a stronger desire for carnal union when the weather is hot, while it is the opposite for men<sup>12</sup>. All of this is explained within the *Problemata*, thanks to a balance between the physiological male heat and the humidity and coldness of the climate, while it happens the opposite for the cold nature of females. It is a thermal balance issue then<sup>13</sup>. The cold months are those in which men desire and are able to mate best. Furthermore, during the cold season, when the northern winds blow, Aristotle says, male births are favoured<sup>14</sup>.

On the other hand, more females are born during the southern wind season. In a specific passage of the *Hist. anim.* the philosopher explains how the excessive humidity of the hot climate does not allow the right fluid-absorption degree needed for the birth of a male, whose bodily nature is hot and dry<sup>15</sup>.

It is not by chance, then, that in Pol. book II and in *Hist. anim.* book VII Aristotle mentions a female horse, which is called *dikaia*, “the righteous”, because of its ability to give birth to offspring resembling the father<sup>16</sup>.

Now, coming back to my proper subject matter, from the birth of a female onwards one continues until obtaining real deformations that trigger resemblances among different types of animals, above all between man and various animal species.

*For in the end, when the movements (that came from the male) relapse and the material (that came from the female) does not get mastered, what remains is that which is most “general”, and this is the merely animal. People say that the offspring which is formed has the head of a ram or an ox; and similarly with other creatures, that one has the head of another, e.g., a calf has a child’s head or a sheep an ox’s head<sup>17</sup>.*

This type refers only to resemblances, in speaking of terata, this most probably regards particular characteristics that are so prominent that they lead to think that there has been a crossover between different species. According to Aristotle, though, these genetic crossovers are very rare given that each animal species has a very precise and well delimited gestational period. The only possibilities of such a crossover are among animals that may have similar gestational periods and, above all, compatible body sizes in relation to the embryonic development. It is not surprising at all to discover that, according to Aristotle, one of the possible consequence, of a repeated genetic crossover is an increasing in terms of female births, as a sign of a great removal from the original process of the transmission of the form<sup>18</sup>.

The further section is on beings born with additional parts, which is lengthier and it is divided into three fundamental subclasses.

The first refers to multiparous animals and, above all, to those that produce eggs. The promiscuity of embryos in close contact with one

another favours an exchange of material among them, with the consequential formation of extra parts transferred from one to the other. Snakes, on the contrary, although oviparous, do not undergo to this kind of degeneration very often, because of the separated disposition of the eggs. Generally, it is not a common deformation within the group of viviparous and uniparous animals. As far as human being is concerned it happens rarely, just in some areas, such as Egypt, where women are considered to be particularly prolific<sup>19</sup>.

The second kind consists of an excess of formation of some limb due to an excessive concentration of material: whenever more material gets “set” than the nature of the part requires

*the result then is that the embryo has some part larger than the others, e.g., a finger or a hand or a foot, or some other extremity or limb; or, if the foetation has been split up, several come to be formed, just as eddies are formed in rivers; here too, if the fluid which is being carried along and is in movement meets with any resistance, two self-contained eddies are formed out of the original one, both of which have the same movement<sup>20</sup>.*

Finally, the third group: the case of fused animals, confirmed by the presence of two hearts. When the heart is just one it means that we are simply dealing with one animal with excess parts.

Based on the Aristotelian cardio-centric view, the heart is central locus of the vital heat, of nutritive, cognitive, sensory and motor function, the first organ that appears in the embryo, and the last to be left by the vital blow and heat. It would be impossible to imagine, then, a living being without this central organ, even though a malformed one<sup>21</sup>.

In the end, missing parts are considered to be like a partial miscarriage rather than a miscarriage of the entire form.

The case of the exceeding and the missing parts shows many resemblances to the phenomenon of living beings born with parts or organs removed from their usual places. Bile, liver, spleen, at times, can form and appear in uncommon parts of the body or be incom-

plete or, as in the case of the gallbladder, even totally absent, without compromising yet any possibility of developing and living<sup>22</sup>.

This type of monstrosity does not include vital organs, such as the heart, because these animals would otherwise not survive, because:

*Those which depart only slightly from the natural usually live; those which depart more than that do not, when their unnatural conformation lies in the parts that control the creature's life<sup>23</sup>.*

I would like to conclude with one final example of a monstrosity that comes at the end of the generative process called *mola uteri*. Aristotle does not define it as a teras, but the description of its causes brings this phenomenon closer to the teratological world previously described. It refers to a calcified tumour formation that in some case could takes the place of the embryo or foetus in the uterus during pregnancy. It is a fleshy mass that is not expelled during birth, it could remains within the abdomen for a very long time, even for years, yet it may cause dysentery or death. These formations are caused by weakness and lack of heat and could remains<sup>24</sup>.

This “Undercooked” or “unformed” material is the extreme limit of material necessity that prevails over all. No formal replication, no result reached, no form of life. It is a non–pregnancy and a non–birth. It has no real name and sometimes it doesn’t even get expelled (“until old age”). In this case the material is completely overwhelmed by an entirely negative outcome: an excess of “undercooked” cold menstrual blood that yields a fleshy mass that hardens in contact with air. The content Aristotle works with, in this case, is given to us in *De morb. mulier.* (I 71, L VIII 148–50; II 178, L VIII 360) in which the predicament of the mola is mainly attributed to the quantitative and qualitative nature of the sperm (there is little and it is unhealthy and dense). The case previously listed, it seems, rather, to be caused by an overabundance of menstrual material that remains cold, so much



as to arise only in women and not in any other animal female species, since they have the most abundant and coldest menstrual cycles of all other females.

In general, terata and birth defects are characterized by their manifestations in the very early stages of formation of the unborn child and their dependency on a material cause including both a type of resistance and a type of excess or deficiency.

This is the way to understand the critique of Democritus' theory on anomalies: malformations do not concern a double emission of spermatic fluid that penetrates at different times, but rather the matter. Alterations will present themselves when, in fact, the form, the paternal impulse cannot prevail over matter and the process degenerates into the different levels, that the process of the transmission of characters may reach while it distances itself ever more from an ideal model for transmitting the male form.

In reality, nature offers a variety of examples concerning this that Aristotle is forced to observe in great quantity. There is a reproductive model in which the finalistic process is quite visible thanks to the reproduction of the paternal form. However, this is not the norm in nature.

The Aristotelian construction used to explain this includes a long chain along which there is a distancing from this model until an extreme is reached.

If we wanted to imagine a theoretical line that represents this, we could start at the beginning with a male child that resembles his father, passing along halfway at the birth of a female, which is already an anomaly, down to a fleshy mass at the end. The cause always concerns a resistance, a counter-push or an excess of material that, the stronger and more dominant it is, the more the process is distanced from the ideal model versus the extreme. This regards a missing end during the course of an otherwise perfect process.

As we have seen, terms such as *πηρώματα*, *τέρατα*, *ἀναπηρία* are used in order to indicate malformations, mutilations. All these are

here considered to be an obstacle to the most natural of all functions: producing another being similar in kind, that is, in form.

From this point of view malformations, along with spontaneous products are against nature, but, in another way, they perfectly take part in nature, as Aristotle clarifies in what follows:

*A monstrosity, of course, belongs to the class of things contrary to Nature, although it is contrary not to nature in her entirety but only to nature in the generality of cases. So far as concerns the nature which is always and is by necessity, nothing occurs contrary to that; no unnatural occurrences are found only among those things which occurs as they do in the generality of cases, but which may occur otherwise. Why, even in those instances of the phenomena we are considering, what occurs is contrary to this particular order, certainly, but it never happens in a merely random fashion; and therefore it seems less of a monstrosity because even that which is contrary to nature is, in a way, in accordance with nature (i.e. whenever the formal nature has not gained control over the material nature)<sup>25</sup>.*

The existing compensation between the end and the material necessity does not permit the first to have the monopoly. The perfection of a sublunary world must continuously take into account the approximations specified by necessity. This seems to be particularly evident in the theory of character transmission, yet emphasized even more so by the presence of anomalies and teras. This is a case against nature *epi to poly*, but not against eternal nature. The birth of female teras attests to this, which is, however, necessary for the genus to carry on eternally in nature. In the end, the anomaly is testimony to the existence of natural processes based on material necessity and mechanicalness, which are otherwise part of the *physis* world just as much as the teleological institution.

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2. See *Phys.* II 199b 4.
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4. I am aware of the still open and large debate about this point, with particular regard to the nature of these impulses, but it is not my concern, now, to

- comment on this. For the purpose of the paper I will assume that, in general, a series of impulses, coming from the father, are responsible for the transmission of both, general and individual characters. On this debate, see BALME D.M., *Aristotle's Biology was not Essentialist*. AGPh 1980; 25: 75-87. Witt C., *Form, Reproduction, and Inherited Characteristics in Aristotle's Generation of Animals*. Phronesis 1985; 30: 46-57. HENRY D., *Aristotle on the Mechanism of Inheritance*. J Hist. Biol. 2006; 30: 426-455. GELBER J., *Form and inheritance in Aristotle's Embryology*. Oxford Stud. Anc. Philos. 2010; 39: 183-212. GILL C., *Essentialism in Aristotle's Biology*. CritQ 2010; 53(4): 12-20.
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  10. *Pol. VII* 16, 1335a 11-18.
  11. *Pol. VII* 16, 1335 a 36 – 41/1335b 1-2.
  12. See *Hist. anim.* 542 a 32.
  13. See *Problem.* IV, 25, 879a 26.
  14. See *De gener. anim.* IV 2, 766b 33-36.
  15. See *Hist. anim.* VI, 19, 573 b 32 – 34 / 574 a 1.
  16. See *Pol. VII*, 1262 a 24, *Hist. anim.* VII, 586a 13.
  17. *De gen. anim.* IV 3, 769b 10-16.
  18. See *De gener. anim.* II 4, 738b 27-35; IV 3, 769b 22-25.
  19. See *De gener. anim.* IV 4, 770a 7-23.
  20. See *De gener. anim.* IV 4, 772b 13-26.
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  24. *De gener. anim.* IV 7, 775b 25-38/ 776a 1-7. On this problem see MANULI P., *Donne mascholine, femmine sterili, vergini perpetue. La ginecologia fra Ippocrate e Sorano*. In: CAMPESE S., MANULI P., SISSA G., *Madre materia. Sociologia e biologia della donna greca*. Torino, Bollati Boringhieri, 1983.
  25. *De gener. anim.* IV, 4, 770b 9-18.

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