Special Historical Note

Darwin's *Questions About The Breeding of Animals* (1839)

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The eight-page quarto pamphlet *Questions About the Breeding of Animals* (see Appendix to this essay) is a rare and, until recently, unpublished work of Charles Darwin.[1] Only a single copy, that in the Library of the British Museum (Natural History), was known until recently, when a copy was located in a collection of documents at the University Library, Cambridge, England.

The privately printed pamphlet, distributed by Darwin himself, bears no printer's mark—only the signature "C. Darwin—12, Upper Gower Street, London." It consists of twenty-one numbered paragraphs which contain forty-eight questions.[2] The printed sections (of 9 cm width) have been placed to the left of each page, presumably to leave the even wider margins created for the inclusion of annotated responses. The pamphlet bears no date.

Dating of the Questions: One of the only references to the *Questions* that can be found is that made by Darwin in the following extract from his autobiography, in which he records that, upon opening his first transmutation notebook in July, 1837, "I worked

1. The present paper was begun in the Fall of 1967, finished that winter, and submitted in the Spring of 1968. I am gratefully indebted to Dr. Richard B. Freeman of University College, London, for first providing me with a copy of the *Questions*—as well as a good deal of relevant information—without which this paper would not be possible. A Facsimile of the *Questions*, edited and with an Introduction by Sir Gavin de Beer, has been published as the Sherborn Fund Facsimile No. 3, December 1968, Society for the Bibliography of Natural History—Ed.

2. Though only forty-five question marks appear in the text, it can be clearly seen, from both context and syntax, that a total of forty-eight questions has been asked. The three unmarked questions are the first questions in paragraphs 8, 10, and 18.

on true Baconian principles, and without any theory collected facts on a wholesale scale, more especially with respect to domesticated productions, *by printed enquiries*, by conversation with skilful breeders and gardeners, and by extensive reading." [3]

Two facts allow the bracketing of the pamphlet's publication between two specific dates. First, as its final page bears the printed address "12 Upper Gower Street"—Darwin's home as of December 31, 1839—this is likely to be the earliest possible date of its publication. Second, as one set of replies to the *Questions* was clearly dated May 5, 1839 by one respondent and the recently-found second copy of the pamphlet is dated by its recipient "10 May 1839", it may be safely concluded that the pamphlet was printed not later than the opening days of May, 1839.[4]

A glance at Darwin's personal "Journal" covering the chronology of his activities in 1839 reveals no period of time before the end of the first week in March sufficient for the preparation of the *Questions*. The entire month of January was spent in preparations for his wedding on the 29th, nearly all of it in Shrewsbury and Maer. At the beginning of February the journal records the recommencement of the Coral Reefs paper. The next entry reads "First week in March Earthquake paper then a little work on Species & then Coral paper.", which is followed by "End of March & nearly all April Coral paper." The middle two weeks of March and the "little work on Species" are undoubtedly those in which he conceived of the idea of the broader method of soliciting factual information represented by the *Questions*.

Reference to Darwin's fourth "Transmutation" notebook (covering enteries from October, 1838 to July, 1839) reveals that the first entry on the subject of animal cross-breeding in 1839 appears after the date " March 5".[5] Numerous notes on the crossing of varieties and species are found on the following eight pages, ending with the following passage dated March 12:

> Varieties are made in two ways—local varieties when whole mass of species are subjected to the same influence & this would take place from changing country: but greyhound race-

3. F. Darwin, ed., *The Life and Letters of Charles Darwin*, 2 vols. (New York: Appleton, 1898), I, 68. Italics mine.

4. Personal communication from P. J. Gautrey, Manuscript Librarian, University Library, Cambridge. Details of these and other items found in the Robin Darwin Deposit at the Library will appear in a paper by P. J. Gautrey and R. B. Freeman in the *Journal of the Society for the Bibliography of Natural History*, London.

5. "Darwin's Notebooks on Transmutation of Species: Part IV—Fourth Notebook (October 1838–July 1839)," Edited and with an introduction by Sir Gavin de Beer, *Bull. Brit. Museum (Nat. Hist.)*, Historical Series, II, no. 5, p. 171.

horse & poulter Pidgeon have not been thus produced, but by training & crossing & keeping breed pure—and so in plants *effectually* the offspring are picked & not allowed to cross.—Has nature any process analogous(?)—if so she can produce great ends—But how (?)—even if placed on Isl[d], if &c, &c,—make the difficulty apparent by cross-questioning."[6]

It should be mentioned here that the transmutation notebooks up to this date show that Darwin had sought much information on various subjects via a number personal letters querying more than a dozen fellow naturalists. It therefore seems likely that an increasing number of questions on this particular subject at this particular time convinced Darwin that a printed list of queries would be a handier method of solicitation. Thus, on or about March 13 Darwin composed the *Questions* and sought out a private firm for their printing.

As Darwin left for Maer on April 26, not to return to London until the May 20 (finding the replies of May 5 and 10 awaiting him), it would seem that his pamphlets must have arrived from the printers some six weeks after his ordering them, on about April 24, and that at least a number of them were dispatched by him in the two days before he left on his holiday.

How the Questions Fits into the Schedule of Darwin's Activities (from the landing of the *Beagle* in October, 1836, to the first 'Species Sketch' of June, 1842): After his reunion with family and the disposal of his collections, Darwin's principal task upon his return was the writing up of his observations into a publishable *Journal of Researches*.

Though he had made attempts at this writing during his stay in Cambridge, Darwin did not begin a really determined effort to write until he moved down to London in March 1837. This task occupied his time almost exclusively to mid-July. It was during this latter period that detailed consideration of the phenomenon of adaptation and its causes fortified the early glimmerings of a belief in the transmutation of species. Though still far from "convinced" that such had taken place—and, at that time, without any notion of a *process* acting towards that end—Darwin opened his first transmutation notebook. It was, as he said, "to record any fact which might bear on the question."

Between the time he opened this first notebook in July 1837 and concluded the fourth and last in July 1839, two significant ideas served to change his original approach. Darwin had begun the first notebook to simply record relevant facts with the leading

6. *Ibid.*, p. 173.

idea, borrowed from Lyell, that the key to past biological change might be found in whatever sources of change could be presently observed. It was in following this line of thought in his initial pursuit of facts that Darwin first came to see that the change effected through *selection,* as practiced by plant and animal breeders, was the key to past change. It was the realization of this concept of change that gave an added dimension to his fact gathering.

The second alteration to Darwin's original Baconian approach came through his reading of Malthus (September 28 to October 3, 1838). Malthus provided the basis for Darwin's seeing the relevance of factors leading to the struggle for existence to his concept of transmutation by selection. Thus, from the opening to the closing of the notebooks, Darwin had expanded his view from a belief in the *fact* of transmutation, to the addition of a *means* by selection, to, finally, the requisite *force* of competitive struggle. By the addition of this last element, his hypothesis (paraphrasing Darwin's own words) "had at last become a theory by which to work."

After closing the last notebook, however, there remained several other obligations to be attended to—principally his impending marriage and the unfinished zoology and geology of the *Beagle*—before he could spread his fact-gathering net more widely. The now-resolved theory would require the collecting of relevant information along more specific, and thus more formal, lines. It would seem that it was just such an attitude that precipitated, in 1839, the *Questions on the Breeding of Animals.*

How the Questions *Fits into the Development of Darwin's Theory* (to the first 'Species Sketch' of 1842): Quite clearly, the *Questions* should be looked upon as more than a formalized interrogation of experts along certain lines. For the actual queries are nearly all *leading questions.* That is, they are framed in such a way as to elicit specific responses which may or may not confirm an existing hypothesis. This is borne out by the conditional-interrogative ("*If* this . . . *will* this . . . ?") syntactic arrangement of nearly all the queries. Thus, the questions can be seen as very much the deductive manifestation of Darwin's own view of how the phenomena of hereditary transmission might bear upon his transmutation hypothesis. As such, the *Questions* proves a valuable document in analyzing the development of Darwin's evolutionary thought during that period between his first clear apprehension of the theory of natural selection, and his first attempt to demonstrate its action in writing.

While the period from Darwin's landing with the *Beagle* (Octo-

ber 1836) to his reading of Malthus (October 1838)[7] is of far greater significance in the actual formulation of Darwin's theory, the interval between Malthus and the first "Species Sketch"— a period of nearly three years—remains of considerable interest. This is partly because we are bound to ask ourselves the question why, if the process of natural selection was at last clearly formulated in Darwin's mind after reading Malthus in 1838, did he delay in writing up his account of how that process effected the transmutation of species?

From within his writings, Darwin provides us with but a single clue: "Here then [after seeing the relevance of Malthus' argument for his selection hypothesis] I had at last got a theory by which to work; but I was so anxious to avoid prejudice, that I determined not to write even the briefest skech of it." [8]

The prejudice seems to be the bias that Darwin felt a theory might impose upon the impartial collection of all relevant facts, for or against the theory. To gather facts first, before beginning the detailed elaboration of any theory which is to transcend them, was Darwin's concept of true scientific method. One should, as he said of himself, "work on true Baconian principles, and without any theory collect facts on a wholesale scale." [9] It remains, however, that Darwin did have a clear theory and, notwithstanding a desire for impartiality of method, this dictated the very specific nature of the classes of facts that he was seeking. A good measure of the reason for his delay lay elsewhere.

Despite his obvious satisfaction in at last having a clear idea of his transmutative process, Darwin had been troubled by the diverse and contradictory implications of the material he had thus far collected on breeding.

The notebooks clearly show Darwin's intention of making his case for evolution in the organic past by projecting back into it those presently observed processes of modification. As a result, he directed his fact-collecting almost exclusively along empirical lines. It had also become obvious to him that any would-be critic could equally apply any presently observable limitations against his account as to what might have transpired in the past. Darwin had come across many such cases, and the notebooks are crammed with such anticipated difficulties: the projected limit to variation; the tendency toward constancy of form seen as a natural function of generation; the tendency of new and hybrid forms to revert to original type; the assumption that old, estab-

7. For a detailed account of this period, see Peter J. Vorzimmer, "Darwin, Malthus, and the Theory of Natural Selection," *J. Hist. Ideas*, 1969.
8. F. Darwin, *Life and Letters*, I, 68.
9. *Ibid.*

lished forms dominate over any newer ones; the problems attached to a blending inheritance. All of these had been gleaned from the existing literature.

As a result of the more than two years of pooling information Darwin had, by the second half of 1839, a clearer and more detailed view of how selection acted, and a rough conceptual picture of the process of hereditary transmission on which it so manifestly depended.

It appeared to Darwin that the stamp of real change upon an existing form must come about through the cumulative addition of small increments of individual variation. Larger increments seemed to either precipitate reversion, reduce fertility, decrease fecundity, or were somehow more susceptible to the prepotent effects of more well-established characters of the same kind. Though he recognized prepotency (as dominance was called) as an obvious and common exception to blending, both blending and reversion remained for him two phenomena the effects of which seemed to run counter to permanent modification of specific type. Darwin had to acknowledge a general tendency in the organic world toward the maintenance (and therefore relative constancy) of specific type. For him, however, there was a big difference between *absolute* and *relative* fixity of species. In other words, it may be *difficult* to permanently modify a species, but not *impossible*.

So it was that Darwin came to feel that, under certain conditions, species could be permanently modified. This process he saw as beginning with individual variation; creating, as it were, a new subvariety in a single individual. The compounding of this first and single degree of difference, under the proper conditions of time and circumstance, to that which would mark a significantly large population as a new specific form, was speciation as Darwin envisioned it.

Darwin saw this process of compounding variation as taking place somewhere deep within the individual. In the early notebooks there is no suggestion of an actual anatomical site where such change takes place (and is recorded for future transmission). He does, in several places, refer to the "blood" in this capacity, but this cannot, at this time, be taken in a literal sense. The blood thus became for Darwin the figurative repository for the germinal "constitution" of an organism. As such, it functioned as the basis for hereditary transmission. Reversion itself (as well as the case of a waning of prepotency) indicated that some sort of storehouse of unit characters persisted through one or more succeeding generations. It was not to be until many years later that Darwin would address himself to the question of

a possible anatomical location for the germinal constitution. By the second half of 1839, however, Darwin did have a limited hypothesis regarding the nature of inheritance.

Beginning in the second notebook, we find Darwin talking of variations that "become more & more impressed in blood with time",[10] and how a "variety when long in blood gets stronger and stronger, so that though by great effort one unlike can be produced." [11] By the opening of the third notebook he offered the maxim "What has long been in blood, will remain in blood,—converse, what has not been, will not remain." [12] But he must have quickly seen the decidedly negative implications that such would have held for transmutation and, a few pages later, he altered this to "An animal in either parent cannot transmit to its offspring any change from the form which it inherits from its parents stock without it be small & slowly attained. N.B. The longer a thing is in the blood, the more persistent any amount of change & shorter time less so." [13]

Darwin continued, giving his view of the transmission of characters involved in a cross:

> When two animals cross, each sends his own likeness & the union makes hybrid, in fact the parents beget child like themselves. Expression of countenances, organic diseases, mental disposition, stature, are slowly obtained & hereditary; if the change be congenital (that is most slowly obtained with respect to that individual) it is more easily inherited,—but if the change be in blood long, it becomes part of [the] animal, —by a succession of generations, these small changes become multiplied, & great change be effected.[14]

By the end of this third notebook we find Darwin applying the above view to a case involving a decidedly new (that is, nonderivative) character—and in the face of blending inheritance.

> If A & B be two animals which have some peculiarity for the first time, & if all their offspring inherit the same peculiarity in lesser degree & theirs again in lesser degree—now if the second race both have this peculiarity strongly; they transmit with same force as first pair, but to this tendency is added the 3rd tendency from first pair.—Now if two of third pair of same peculiarity breed they will have the same influence as first pair

10. "Darwin's Notebooks . . . ," N.B. II:33.
11. *Ibid.*, II:136.
12. *Ibid.*, III:13.
13. *Ibid.*, III:16.
14. *Ibid.*

+ tendency they inherited from second pair, + the influence they themselves *inherit*.[15]

Confusing, perhaps, but not entirely unclear. It seems that, for Darwin, not only could the new variation itself be transmitted, but also the original predisposition producing such a variation *ab initio*. At first glance it would appear that Darwin is here bringing to bear a rather *ad hoc* assumption to counter the implied effects of a blending inheritance. And this may well be the case if one looks for some contemporary justification. However, it is quite understandable if one sees that Darwin felt that not only the variation, but that unique set of constitutional peculiarities which predispose any organism bearing them to produce such a variation, was also inherited. The important difference between Darwin's and the modern view is that Darwin looked upon the two as not only separate but *additive*—and therein lies the real distinction. Such was the shape of Darwin's view of inheritance relative to transmutation up to the time he decided to seek the further information requested in the *Questions*.

Despite the apparent orderliness of their presentation, the forty-eight questions set forth in the pamphlet were not grouped together in a systematic fashion. The following table provides a more systematic outline of the nature of the inquiry:

I. Darwin seeks factual information on basically three types of crosses: Species x Species; Species x Variety; and Variety x Variety. The following considerations (with regard to the nature of the actual crossing elements) super-imposed on the above crosses, add several permutations: Male x Female; Wild x Domesticated; Established x New or Recent; Closely Related x Disparate Forms.

II. The information sought:
   1. Is the cross sterile or fertile and/or is fecundity affected?
   2. If fertile, is the result a dominance or blending of characters?
   3. If dominance, which parent form and which sex?
   4. If blending, in subsequent generations is intermediate form maintained, or does it revert to one of the originals?
   5. Second inter-cross (F_2) generation: 1–4 above?
   6. Second back-cross generation: 1–4 above?
   7. Are the following inherited?
      a. fertility and/or fecundity?

15. *Ibid.*, III:169.

b. new and continuous variations? [16]
c. new and discontinuous variations?
d. predisposition to variation?
e. direct effects of conditions?
f. effects of habit or use?
g. effects of disuse, mutilation, or abuse?
h. instincts or behavior?

8. If inherited, in above crosses: 1–4 above?

All of the questions, save the 47th in paragraph 20, can be seen to fit somewhere in the above scheme. As such they represent quite a comprehensive interrogation on the subject of crossing and the transmission of characters involved.

Darwin's own continuing readings and later researches, together with his assimilation of the new information which he received, not only provided the very basis of his theory of natural selection but, in the years after the *Origin,* were to result in his publishing a theory of inheritance of his own.[17] Thus, the *Questions about the Breeding of Animals* is one of the earliest of Darwin's writings to give some indication of the direction in which he was moving.

Appendix

QUESTIONS

ABOUT THE

Breeding of Animals

1. If the cross offspring of any two races of birds or animals, be interbred, will the progeny keep as constant, as that of any established breed; or will it tend to return in appearance to either parent? Thus if a cross from the Chinese and common pig be

16. For Darwin, the term "continuous" was applied to a variation which was slight and discernible as qualitatively relating to pre-existing structure; "discontinuous" referred to a saltation or a qualitatively unrelated structure.

17. For further information see R. C. Olby, "Darwin's Manuscript of Pangenesis," *Brit. J. Hist. Sci.,* 1:258–269 (1963), and P. J. Vorzimmer, "Charles Darwin and Blending Inheritance," *Isis,* 54:371–391.

interbred, will the offspring have a uniform character during successive generations, that is, as uniform a character, as the purebred English or Chinese ordinarily retains? Thus, again, if two mongrels, (for instance of shepherd dog and pointer) which are like each other, be crossed, will the progeny, during the succeeding generations retain the same degree of constancy and similarity, which might have been expected from pure-bred animals? Is it known by experience, that when an attempt has been made to improve any breed by a cross with another, that the offspring are apt to be uncertain in character, and that *unusual* care is required in matching the descendants of the half-bred among themselves in order to keep the character of the first cross? Always please to give as many examples as possible, to illustrate these *and the following* questions.

2. If by care, the character of half-bred animals (mongrels or hybrids) be preserved through some two, three, or more generations, is it then generally found, that the character becomes more permanent, and less care is required in matching the offspring? If this be so, how many generations do you suppose is requisite to form a mixed race, into what is ordinarily termed a permanent variety or well-bred race?

3. Supposing some new character to appear in a male and female animal, not present in the breed before, will it become more permanent, and less likely to disappear, after it shall have been made to pass through some successive generations, by picking out and crossing those of the offspring, which happened to possess the character in question?

4. In crossing between an old-established breed, or local variety, which from time immemorial has been characterized by certain peculiarities, or the animal in its aboriginal state, with some new breed, does the progeny in the first generation take more after one than the other? or if not so, is the character of one more indelibly impressed on the successive generations than that of the other? Or, which is the same question, is the *breed* of the parents of more consequence, when a *breeding* animal is wanted, than when merely a fine animal is wanted in the *first* generation? The effect should be observed both in a female of the old race crossed by the new, and a female of the new crossed by a male of the old; for otherwise the greater or less preponderance of the peculiarities in the progeny might be attributed to the power of the sex, thus characterized in transmitting them; and not to the length of time the breed had been so characterized. Thus to take an extreme example, we may *presume* that an Australian Dingo is an older breed than a pug-dog: if both were crossed with Spaniel bitches, would the litter in the one case more

resemble the Australian, than in the other case the pug: and however this may be, would the pug, or Australian character be most persistent under similar circumstances in successive generations? How would this be in the various breeds of cattle? Thus if a Bull (or a cow) of a breed which had long been known to have been white with short horns, were crossed with a black cow with long horns, (or Bull, if the first were a cow) which had accidentally sprung from some breed, not thus characterized, would there be any marked leaning in the character of the calves to either side; or would *successive* generations have a stronger tendency to revert to one than the other side? Please to mention in detail any instances you may be acquainted with.

5. What would the result be, in the foregoing respects, in crossing a wild animal with a highly domesticated one of another species, supposing the half cross to be fertile? Thus if a fox and hound were crossed with pointer-bitches, what would the effect be both in the first litter and in the successive ones of the half-bred animals? To form a judgment on this latter point, the subsequent crosses in each case should be relatively the same; thus the half-bred fox and half-bred hound should be recrossed with the pointer, or with some other, but the same breed.

6. Where *very* different breeds of the same species are crossed, does the progeny generally take after the father or mother?

7. When two breeds of dogs are crossed, the puppies of the same litter occasionally differ very much from each other, some resembling the bitch and some the dog. In the mule between the ass and horse, this great variation does not appear commonly to occur. Do you know any cases, where two *varieties* have been often crossed, and *mongrels* have been uniformly produced similar to each other within small limits, and intermediate between their parents? And on the other hand, do you know of *hybrids*, between such animals as are generally considered distinct *species*, varying in this manner?

8. When breeds extremely different (as the grey-hound and bull-dog, the pouter and fantail-pigeon,) are crossed, are *their offspring* equally prolific, as those from between nearer varieties (such as from the grey-hound and shepherd-dog). Is the half-bred Chinese pig as prolific as the full-bred animal? Does a slight cross increase the prolifickness of animals?

9. Do you know of instances of any character in the external appearance, constitution, temper, or instinct, appearing in half-bred animals, whether mongrels or hybrids, which would not be expected, from what is observable in the parents?

10. In those rare cases, where hybrids *inter se* have been productive; have the parent hybrids resembled each other; or have

they been somewhat dissimilar, partaking unequally of the appearance of their pure-bred parents. Also, what has been the character of the progeny of such hybrids?

11. When wild animals in captivity, cross with domesticated ones, is it most frequently effected by means of the male or female of the wild one?

12. Amongst animals (especially if in a free, or nearly free condition,) do the males show any preference, to the young, healthy, or handsome females? or is their desire quite blind?

13. Where a female has borne young to two different breeds or kinds of animals, do you know of any instances, of the last born partaking of any part of the character of the first born, and to what extent?

14. When a female of one breed has been crossed by a male of another breed *several times,* do the last-born offspring resemble the breed of the father, more than the first-born, and therefore are they more valuable in those cases, where the peculiarity of the father is desired?

15. Do you know instances of any peculiarities in structure, present for the first time in an animal of any breed, being inherited by the grand-children, and *not by the children*? It cannot be said to be *inherited* without it appear in more than one of the grand-children, or without it be of an extremely singular nature; for otherwise it ought to be considered as the effect of the same circumstances, which caused it to appear in the first case.

16. What are the effects of breeding in-and-in, very closely, on the males of either quadrupeds or birds? Does it weaken their passion, or virility? Does it injure the secondary male characters,—the masculine form and defensive weapons in quadrupeds, or the plumage of birds? In the female does it lesson her fertility? does it weaken her passion? By carefully picking out the individuals most different from each other, without regard to their beauty or utility, in every generation from the first, and crossing them, could the ill effects of inter-breeding be prevented or lessened?

17. Where any animal whatever (even man) has been trained to some particular way of life, which has given peculiarity of form to its body by stunting some parts and developing others, can you give any instances of the offspring inheriting it? Do you know any such case in the instincts or dispositions of animals? If an animal's temper is spoilt by constant ill usage, or its courage cowed, do you believe the effect is transmitted to its offspring? Have any cases fallen under your observation, of quadrupeds (as cats or pigs, &c.) or birds (fowls, pigeons, &c.) born in this country from a foreign stock, which *inherited* habits

or disposition, somewhat different from those of the same variety in this country? If removed early from their parents, there are many habits, which we should be almost compelled to believe were inherited, and not learnt from them; and if transmitted to any half-breed we should feel sure of this.

18. Can you give any detailed account of the effects on the mind, instincts or disposition of the progeny, either in the first or in the succeeding generations from crossing different breeds, (for instance carrier and tumbler pigeons, grey-hounds and spaniels) or different species (as fox and dog.) Do they show an aptness to acquire the habits of both parents? Or do they partake strongly of the habits of one side, (if so, which side?) with some peculiarity showing their hybrid origin? Or do they entirely follow one side?

19. Can you give the history of the production in any country of any new but now permanent variety, in quadrupeds or birds, which was not simply intermediate between two established kinds?

20. Do you know any cases of different breeds of the same species, (as of dogs &c.) being differently affected by contagious or epidemic diseases, and which difference cannot be attributed merely to a greater vigour in the one breed than in the other? In countries inhabited by two races of men, facts of this kind have been observed.

21. All information is valuable, regarding any crosses whatever, between different wild animals, either free or in confinement, or between them and the domesticated kinds; *equally so* between any different *breeds* of the same species, especially the less known kinds, as Indian with common cattle, different races of Camels, &c. Please to state all or any particulars, for what the cross was made and whether it is habitually made; whether the female had offspring before; whether she produced as many of the half-breed at one birth, (if more than one be produced) as she probably would have done of the pure breed; whether the progeny were fertile *inter se*, or with their parents whether they resembled one stock more than the other and in what respects, and which; and whether the favoured side was the male or female. State, if known, whether the progeny differ when stock (A) is the father and (B) the mother, and from what it does where (A) is the father and (B) mother. If the half-bred are fertile, *inter se* or with the parent stock, describe the offspring whether like their parents and all like each other, or whether they revert to either original stock, or whether they assume any new character?

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