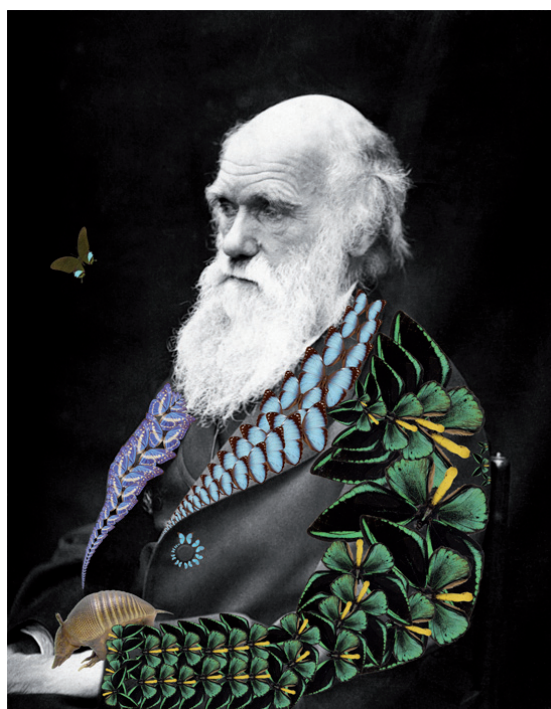


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THE “INTERPLAY OF THE ACTUAL AND THE POSSIBLE”
IN THE *ORIGIN OF SPECIES*

What is original in Darwin’s explanation lies in his effort to answer the crucial question he poses in *The Origin of Species*, that of how new species are produced in Nature. His work is also original in terms of the argumentative strategies employed. These strategies are related to the principles of the general structure of his argument, as demonstrated in his *particular whole-part movement* (the way in which he refers backwards and forwards to specific arguments in the development of each chapter), in his *comparison of points of view* (where he affirms the superior explanatory power of his theory over that of “creationism”), in the *treatment of difficulties, objections and exceptions* (the way in which his theory is able to account for even those cases which are apparently more unfavourable to it), in his fair evaluation of the *weight of reasons* (the interrelationship of the facts and reasons referred to within the context of his explanation), in his *appeal to the explanatory power of his “one long argument” as a whole* (the phrase he uses to refer to his treatise), and in the *interplay of the actual and the possible* (which is one of Darwin’s most innovative strategies, and the subject of this analysis¹).

The strategy adopted by Darwin for the *interplay of the actual and the possible* consists of three parts overall. The first of these clarifies the concept of *possibility*, particularly of how the principle in question can be viewed in terms of the theory by establishing what the reader should **not** expect from it (i.e. *what is not possible*), or by exploring the *absence of logical impossibility* or the *presence of factual possibility*. In the second part (in the light of what is possible in principle and what is really possible), Darwin establishes *what is possible in certain particular situations*. In the third part, he determines *what is actually given in terms of what can really be given*. He uses a variety of mechanisms in the *Origin* to reinforce specific *possibilities*, and does not always do this by means of a generalisation or something which leads to a generalisation. An occurrence may be “highly probable” *if it can be clearly conceived* by specifying examples through careful weighing of the evidence, or by the fact that it cannot be doubted. In the *Origin*, “probability” includes both *possibility* (the conceptual and/or factual possibility of an occurrence or of a determined explanatory

¹ Other strategies used by Darwin include the *appeal to ignorance*, to the *advance of research*, to the *psychological, sociological and ideological conditions and values of investigation and of the scientific community*, to the *authority of well-known scientists*, to the *familiarity* of the evidence, to the *progressive character* of the minds of those who Darwin expects to support his theory, and to the *cognitively revolutionary* nature of his theory.

hypothesis) and *proof*, which indicates a particular degree of expectation in relation to each prediction or retrodiction. Darwin often begins an argument by establishing what is “conceivable”, and concludes by saying “it is, therefore, highly probable...”, as he does when referring to studies analogous to his carried out by Landois:

“But *it is conceivable* that the now utterly lost branchiæ have been gradually worked in by natural selection for another purpose: for instance, Landois has shown that the wings of insects are developed from the tracheæ; *it is therefore highly probable* that in this great class the organs which once served for respiration have been actually converted into organs for flight.” (Darwin, 1872, p.148) – *our italics*.

Since it places the real in the sphere of the possible, and is more than a merely heuristic resource, Darwin’s strategy “reinforces” our knowledge of Nature as a system within which “probabilities” and “tendencies” express the effective way of being of Nature itself. The ontological premise of a uniformity in the process of Nature as a complex system, and the epistemological allow imagining *possible* occurrences and establishing *possible* explanatory frameworks. The joint examination of the range of logical-conceptual and factual *possibilities*, from what is *actually* given and what is *ignored*, transforms *possibility* into a legitimate explanatory condition. In the absence of any evidence to the contrary, the inference of *possible* past conditions for the determination of actual occurrences is a satisfactory explanation, as is the inference of *possible* conditions to explain the absence of a determined occurrence. “Probable” is not the same as “doubtful”, but rather encompasses the exploration of objectively *possible* alternatives. Thus, according to Darwin, we must conclude from the fact that various domestic species are completely fertile amongst themselves (even though they may descend from two or more wild species) that either the parent species initially produced hybrids which were completely fertile, or that the hybrids which were subsequently created then became fertile. The latter alternative, originally proposed by Pallas, seemed to Darwin to be by far the most probable and the most difficult to doubt, and his selection of this alternative was preceded by a detailed discussion (Darwin, 1872, p.240-241). Within the sphere of the exploration of possibilities, probability may also reflect the impossibility of excluding other possibilities, as is the case when we admit that “it is probable” that strictly contemporaneous forms have been accumulated over large areas of the same parts of the world, but “we are far from having any right to conclude that this has invariably been the case and that large areas have invariably been affected by the same movements” (Darwin, 1872, p.300).

It is true that Darwin also admits that a given occurrence can also be considered “not probable” *vis-à-vis* the evidence we have at our disposal. For example, given what we know about the great geological changes which occurred in other parts of America during the Ice Age, it is not probable that sediment was deposited during this period near the estuary of the Mississippi to a depth at which marine animals can best flourish (Darwin, 1872, p.276). Known facts can exclude the probability of other occurrences, especially in the case of hypotheses which can in some way conflict with Darwinian theory. In terms of support for this theory, the focus is on “what is not impossible”. For example, “there is nothing improbable” in the case of a given insect which has varied and rudely resembled the features of its exterior, to become more

or less green, if its exterior so becomes, leading to protective mimicry and natural selection by preserving those modifications which are useful (Darwin, 1872, p.182). In the artful game of possibilities and impossibilities, probabilities and improbabilities, the argumentation in favour of Darwin's theory emerges victorious by means of the *refutation of objections* which are made against it (Darwin, 1872, p.299-300).

The absence of "logical impossibility" can be considered as a "reason" for the acceptance of a determined explanatory hypothesis. The theory therefore benefits from the discussion of *what may or may not be probable* in the process of the action of natural selection (for example, in delicate subjects such as sterility between species). This clarifies its scope and thereby makes possible new advances in intelligibility. In such situations we can see that *the interplay of the actual and the possible* is not a trivial one, but is rather an instrument which allows Darwin to delve into, with the greatest possible conceptual rigour, questions which cannot be answered immediately, and establish the explanatory power of his theory. In the final analysis, the range of *possibilities*, supported by what is *actually* given, and with the *impossibilities* removed, reinforces the theory through which and by which the gates are opened to what is *real*.

By means of the interplay between the real and what is not given, what is ignored and why, and what is possible, *difficulties* are explained, or rather clarified, restructured, dissolved (seen as "apparent" or "misplaced") or responded to (i.e. considered to have some "real" basis which needs to be dealt with). The starting point for this process is always to try and *understand the difficulty*, and to clarify its substance. The explanatory task may end there and then, having demonstrated that *there is no difficulty* to be discussed, nor any objection to be responded to. Alternatively, understanding the difficulty can make room for a *discussion* of the largest number of relevant factors possible, which can then lead to arguments which are sometimes long and complex, and which comprise a range of different elements, e.g. facts, plausible premises, comparison with the explanatory power of alternative views, considerations relating to the cognitive faculties, and successive reassessments of the evidence available. The ultimate aim of dealing with objections is, in a certain sense, to render them "apparent". If they have a "real" basis, this is not only related to Darwinian theory, but is due to *difficulties* in terms of our current cognitive and investigative resources, or to *difficulties* which are intrinsic to any theory in the determination of such a complex object.

Difficulties become apparent through the clarification which Darwin's theory provides, or through analysing the basis of the difficulty concerned. This is what happens in the case of the most serious objection levelled against the theory, that of the absence of numerous transitional forms (Darwin, 1872, p.265). This absence is explained by the obvious incompleteness of the geological records available at that time. In the light of explanations provided for the movements in the surface of the earth, of considerations relating to conditions of fossilization, and of the conditions which Darwin's theory states as being propitious to the appearance of new forms, this lack of evidence was only to be expected (Darwin, 1872, p.275 and p.288-289), as was the *impossibility* of completely reconstituting the fossil chain, without which the transitional forms could not be conclusively classified (Darwin, 1872, p.134-135, p.189, p.264, p.255-277, p.278, p.279-280, p.289, p.313 p.408). When it is *possible* to find evidence favourable to Darwin's theory, paleontology provides it (Darwin, 1872, p.282, p.284, p.287).

The conjunction of factors which, according to Darwin's theory, interfere in the possibility and characterisation of the evidence do not only explain the absence of the latter but also the presence of "apparent" *counter-examples*, which can be given in the form of exceptions to the rules which are clearly determined by the theory. These exceptions can be dealt with as they are allegedly few in number and, once the circumstances have been clarified in order to demonstrate that there has been interference of other factors without affecting the validity of the rule, the anomaly subsequently disappears. This is the case with the apparent exception to the rule of similarity of the endemic productions of islands and the nearby continent (Darwin, 1872, p.354-355). Some exceptions may appear to be directed at the core of the theory, e.g. certain facts of geographical distribution of species produced in comparatively recent times (Darwin, 1872, p.320-322). Even in these cases, however, clarification of the facts involved cause the anomaly to disappear. There then comes into play, in addition to the resources provided by the "new" geology (which is integrated with the view of the theory of natural selection), conjecture related to means of migration, which is explored at the level of *factual possibilities* (Darwin, 1872, p.343-344 and p.352-353). The explanation of the facts of geographical distribution is a good example of the role of conjectures, i.e. "adequate" assumptions for the elimination of *difficulties*, which have originated, in their turn, from unsound suppositions (Darwin, 1872, p.30, p.320-330 and p.303-306).

The strengthening of the explanatory possibilities of the theory (in *favourable situations* and in Darwin's adroitness at dealing with the objections raised) allows Darwin to reassess the available evidence and place it within the framework of the positive argumentation of his theory, or redirect its target. His strategy of initially weakening the objection raised is part of a discussion which begins by relativising the weight of the said objection and its initial impact. Another part of his strategy is to recognise the seriousness of the objection, which helps to increase the *possibility in principle* that the theory will be able to deal with these *difficulties* (Darwin, 1872, p.206). If it can be shown that the theory can account for even the most intricate cases – such as that of the sterile ants (Darwin, 1872, p.229-232) – the superiority of Darwin's theory will have been established once and for all. Questions which are central to the theory of natural selection are necessarily outside the scope of *actual* evidence, and thus lend decisive importance to the *interplay of the actual and the possible*, as in the case of two serious difficulties: the formation of a complex organ such as the human eye, and the acquisition of complex instincts by natural selection.

In the case of the formation of the human eye by natural selection, the appeal to the *explanatory power of the theory as a whole guarantees, in principle, the possibility* of its production by natural selection (Darwin, 1872, p.156). The objections raised are explained as "equivocal" (Darwin, 1872, p.151-152). Darwin affirms that it is necessary to use faculties such as reason and imagination, indeed *reason should overcome imagination* (Darwin, 1872, p.143-144, p. 145, p.146 and p.404), analysing every aspect of the difficulty in minute detail, and searching for favourable evidence in analogous situations (Darwin, 1872, p.147). We should discard what is not relevant to the issue in question, such as the demand for simultaneousness of the different useful variations (Darwin, 1872, p. 170), filling in the gaps so that we can rationally take account of the different aspects involved in the premises which impinge on the theory. At the core of the objection is another question which will also be raised about

the development of other organs and structures: how, in the initial stages, without the obvious utility of the developed form, can minute variations be useful? Would they not simply be lost among all the others? Darwin's strongest argument in answer to these questions is the *possibility in principle* of these occurrences and of the action of natural selection (Darwin, 1872, p.183-185), which explains very successfully a large number of facts, as well as *the inexistence of conclusive evidence to the contrary*:

“Although the belief that an organ so perfect as the eye could be formed by natural selection, is enough to stagger any one; yet in the case of any organ, if we know of a long series of gradations in complexity, each good for its possessor, then, under changing conditions of life, there is no logical impossibility in the acquirement of any conceivable degree of perfection through natural selection. In the cases in which we know of no intermediate or transitional states, we should be extremely cautious in concluding that none can have existed, for the metamorphoses of many organs show what wonderful changes in function are at least possible” (Darwin, 1872, p.165).

The difficulty in the case of the explanation of the acquisition of complex instincts (which correlate to other significant structural and physiological modifications) can be measured by its application to what may be the most difficult case of all, that of the sterile ants. By means of this case, Darwin intends to “*prove*” the *validity* of his principal claim, that of the general power of natural selection (Darwin, 1872, p.233). This *discussion* begins, as in the case of the formation of the human eye, by weakening the objection via reference to the *factually encountered possibility* that insects can become sterile (which is therefore not impossible in principle). The objection is weakened even further in the case of social insects, since natural selection will act in accordance with what is good for the community. Darwin restates the difficulty in order to continue discussing it: the sterile ants display considerable differences to the males and females of the ant colony. By putting it in this way, he treats the *difficulty* by focussing on *possible factors of interference*. It is important to remember that changes may be produced not only by the direct action of natural selection, but as the effect of laws of correlation, that natural selection can apply to the family, and that analogous situations related to plants can be examined. The climax of the difficulty is thus concentrated on the occurrence of castes of sterile ants, which is then removed by reference to *occasional empirical findings* by *different authorities* of gradations and differentiations between sterile ants belonging to the same niche, and by the always strong *appeal to the power of the theory which, in principle, can be attributed to natural selection* in order to explain the preservation and accumulation of useful variations (Darwin, 1872, p.229-232). Both in factual and theoretical terms this is not impossible but, on the contrary, there is an *(increasingly) strong possibility* for this explanation.

The *possibility in principle* of accounting for objections and the *impossibility of proof to the contrary* reinforce the legitimacy of the explanatory premises within the realm of the *possible* by responding to the difficulties raised and constructing explanatory pillars for facts where Darwin's theory is clearly superior (Darwin, 1872, p. 301, p.341, p.343-344, p.352-353, p..360, p.365, p.375, p.410), thereby enhancing the credibility and viability of the theory of natural selection. Darwin's explanatory effort exploits the realm of the *actual* to the maximum, and extends the frontiers of the *possible* to their outer limits.

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