

ON THE SPECIFICITY OF TELEOLOGICAL EXPLANATIONS

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I. DARWINISM (OLD AND NEW), AND THE PROBLEM OF TELEOLOGICAL EXPLANATION

Any serious endeavor to think about teleology cannot overlook the work of Aristotle and that of Darwin, nor the conceptual relations between the two. The connection between Aristotle, Charles Darwin and teleology brings immediately to mind one fact: one of Darwin's main contributions to the progress of thought was the manner by him envisaged to explain teleology without appealing to Aristotelian final causes. On one hand, Darwin was open to recognizing that organisms sometimes have ends (*tele*). An organ serves a purpose, e.g. the heart pumps blood. Pumping blood is the end (*telos*) of the heart. On the other hand, Darwin's treatment of *tele* changed the Aristotelian tradition. Since Aristotle, the fact that organisms have ends had been taken to prove that there are final causes: pumping blood would be one of the causes of the existence of the heart. Darwin found a way to explain the existence of the heart and of its ends, which does not postulate the existence of final causes. His form of explanation employs only mechanical causes, what Aristotle would have called material and efficient causes. According to Darwin, the end of the organ would be an adaptation resulting from long processes of reproduction, variation and selective pressure operated by the environment, which involved the ancestors of the organism to which the organ belongs. Those processes could be accounted for in purely mechanical terms:

if variations useful to any organic being ever do occur, assuredly individuals thus characterised will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance, these will tend to produce offspring similarly characterised. This principle of preservation, or the survival of the fittest, I have called natural selection. It leads to the improvement of each creature in relation to its organic and inorganic conditions of life; and consequently, in most cases, to what must be regarded as an advance in organisation. Nevertheless, low and simple forms will long endure if well fitted for their simple conditions of life.¹

The dispensation with final causes had far-reaching implications, which involved Darwin's biologic thinking but also his religious and, more generally, his ethical and philosophical views. On the scientific side, his account of teleology allowed him to account for the origin of species without endorsing creationist speciation, the view that each species is the object of a distinct act of creation. This was for example the view held by the geologist Charles Lyell, whose work was very well known to Darwin.² Creationist speciation rested on several premises. I recall here the following: that each species has a *telos*, that a *telos* can only be explained via a final cause, and that a final cause is necessarily an intentional cause, since the focal example of final causes is intentional action. For example, an artisan's states of mind (his projects) would be the final cause of an object he makes. Since final causes operate everywhere in nature, creationist biologists contended, there must be an artisan who made the whole universe, and this would

1 Charles Darwin, *The Origin of the Species by Means of Natural Selection* (Murray, 1873), 103.

2 See Charles Lyell, *Principles of Geology* (Murray, 1935), 99 and following.

be what we call God. Creationism was a common view among the theologians who taught at Cambridge University when Darwin read theology there, with the view of making a career in the Anglican clergy. Indeed, some of the Cambridge theologians who most influenced Darwin, like John Stevens Henslow and Adam Sedgwick, were mostly occupied with natural sciences, which they took to be the most promising rational way to establish God's existence. These theologian-naturalists cultivated Darwin's remarkable scientific talents.³

From the theological and philosophical point of view, Darwin's original account of teleology convinced him that everything, including the unique cognitive and moral capacities of humans, could be explained as adaptations, or, anyway, as byproducts of adaptive processes. He ended up believing that the thesis that there is a God is completely unsupported, since final causes could be accounted for without the need for an artist. He became an agnostic, giving up his traditional religious beliefs, even if he was never too open about it out of respect for his pious wife.⁴

Neo-Darwinism, the contemporary version of evolutionism — which completes the explanation of the origin of species through natural selection with the latest discoveries in genetics — is commonly understood to bring the philosophical consequences of Darwinism further than Darwin himself had brought them.⁵ The absence of final causes would not only show that no God is needed in an account of the universe, but it would also show that morality does not have to be interpreted realistically. Morality would be an illusion which we cannot resist, but evolutionism would have shown us that there are no truth-makers — or validity-makers — for moral judgments. Moral statements are cognitive, but always false, since — evolutionism allegedly teaches us — there is no feature of the universe which can make them true or valid.⁶ Indeed, since there are no final causes, the current state of the universe is contingent, and the universe could have evolved in completely different ways than it actually did. If our psychological set-up had been different, we would have had moral intuitions completely different from those which we actually have. And this would show that our moral judgments are not meant to track objective moral truths (truth- or validity-makers): belief in such “truth-” or “validity-makers” would then be completely ungrounded.

The claim that the neo-Darwinian worldview can account for everything is contentious to say the least, and it has been recently criticized by Thomas Nagel.⁷ Nagel complains that some features of reality which we have access to in our experience and which seem to have the epistemic status of basic truths cannot be accounted for in neo-Darwinian terms: consciousness, cognition and value, the latter being the hardest of the three to account for in evolutionary terms. It is worth stressing that the point here is not a criticism of evolutionary theory as a piece of science, the truth of which is not under question.⁸ Nagel criticizes what he calls “the materialist neo-Darwinian conception of nature,” which is

a comprehensive, speculative world picture that is reached by extrapolation from some of the discoveries of biology, chemistry and physics — a particular naturalistic *Weltanschauung* that postulates a hierarchical

3 For an account of the relations between Darwin and his theology and natural sciences mentors in Cambridge, see Ernst Mayr, *One long Argument. Charles Darwin and the Origin of Modern Evolutionary Thought* (Harvard University Press, 1991), Chapter 1.

4 On Darwin's attitudes toward religion and on the influence of his wife on his writings, see Tim Lewens, *Darwin* (Routledge, 2007), 32 and 34-7.

5 Neo-Darwinism attempts to merge Darwin's theory with Mendelian genetics. This view was proposed already in the first half of the twentieth century. The first popularization of this view was Julian Huxley, *Evolution, the Modern Synthesis* (Allen and Unwin, 1942). In more recent times, Neo-Darwinism developed a gene-centred, radically reductivist account of evolution. See, for example, Richard Dawkins, *The Selfish Gene* (OUP, 1976).

6 For the view that morality is a product of evolution and that our belief in normativity is ultimately illusory, see Sharon Street, “A Darwinian Dilemma for Realist Theories of Value,” *Philosophical Studies* 127, no. 1: 106-66; Richard Joyce, *The Evolution of Morality* (MIT Press, 2006).

7 See Thomas Nagel, *Mind and Cosmos* (OUP). Nagel seems to have in mind views like that of the very influential philosopher Daniel Dennet (cf. p. 13), but he also discusses extensively Sharon Street (cf. note 6 above).

8 I have defended — independently from Nagel — a distinction between evolutionary theory as a scientific theory and evolutionism and a pseudo-philosophical world-view in Gabriele De Anna, *Scienza, normatività, politica. La natura umana tra l'immagine scientifica e quella manifesta* (Franco Angeli, 2012).

relation among the subjects of those sciences, and the completeness in principle of an explanation of everything in the universe through their unification.⁹

The point at stake is whether this world-view can really account for our experience completely, and a negative answer to this question does not call for a revision of scientific data, but for a better philosophical understanding of them. Nagel contends that in order to account for the existence of consciousness, cognition, and, in particular, value, we should recognize that evolution is heading somewhere, i.e. that some fundamental laws of nature must be teleological. The teleology he has in mind does not involve intentionality and so it is completely detached from theistic implications.

Recent debates suggest that the equation between teleology, theology and ethics is not as straightforward as it was taken to be by Darwin's contemporaries — in particular by his Cambridge instructors — and as recent Neo-Darwinists still assume. This calls for a revision of the role of teleology and teleological explanation in science and in philosophy, and for a reassessment of what the achievements of Darwin really meant for the older tradition, in particular for the Aristotelian account of teleology. In this context, a book by the French philosopher and historian of Medieval and Modern philosophy, Etienne Gilson can still be of great interest: *From Aristotle to Darwin and Back Again. A Journey in Final Causality, Species, and Evolution* (1971). In the next section and in the following one, I will consider some of the claims made by Gilson in that book, which are, in my view, relevant for the current debate I mentioned above. In particular, I will consider his analysis of Aristotelian teleology and its oblivion; then, I will summarize his arguments contending that Darwin's views open the way for a possible return to genuine Aristotelian teleology. In the following section, I will suggest some of the implications of Gilson's thinking on teleology and I will comment on the importance that they can have in current discussions. I will conclude with a section on the legitimacy of teleological explanations and on the role that they should have in philosophy.

II. GILSON'S ACCOUNT OF ARISTOTELIAN TELEOLOGY AND OF ITS OBLIVION

Gilson is mostly known for his contributions to the history of philosophy, in particular for his works on Aquinas and on Descartes. His interest in the history of philosophy, however, was mostly driven by a theoretical aspiration, which is evident in part of his production, as in his James Lectures, delivered at Harvard University in 1936.¹⁰ The rigor of the historian allows him to develop a theoretical philosophy which is not only historically informed, but also sensitive to the far-reaching consequences of current assumptions, and very articulated in the analysis of concepts and their historical trajectories. The virtues of his theoretical approach are at work also in *From Aristotle to Darwin and Back*. In a time — the Sixties — when the debate on Darwinism and its consequences on our conception of humans and their place in reality was particularly lively also in France, he offered a contribution, which, through the tools of historiography, disentangled many conceptual ambiguities which were common.

The argument by Gilson moves from his account of Aristotle's view of teleology in the philosophy of life, in particular in the *History of Animals* and in the *Parts of Animals*. These Aristotelian treatises are maybe the least known among philosophers — although they are well known to historians of philosophy. The reason is maybe that unlike the books by Aristotle on ethics, politics, and metaphysics, they rely on outdated science, and on a method which is very far from that of current scientific research. However, in Gilson's view, it is precisely the method of Aristotle which can be interesting today. I would say that, according to Gilson, Aristotle's method is currently discredited as a scientific method, for people do not generally realize that Aristotle is not attempting to do science in those works, but *philosophy of life*. And philosophy of life is a discipline of which we have lost sight because of the developments of modern science. Rethinking Aristotle's philosophy of life can help us today to regain a sense of the need and the method of this branch of philosophy.

9 Nagel, *Mind and Cosmos*, 4.

10 Etienne Gilson, *The Unity of Philosophical Experience* (Ignatius Press, 1999). The first edition is from 1937.

In his philosophical writings, Aristotle did not claim to be a physicist or a biologist, in the sense in which those disciplines were practiced at his time, and he had a clear sense that he was relying on the empirical findings reached by others.¹¹ He taught that a philosopher must be up to date with the results of science, since his task is to explain the whole of experience, including the aspects of it which science uncovers. According to the Aristotelian methodology, a philosopher must explain what experience presents us by finding its principles, i.e. those statements which make a whole area of experience intelligible.¹² Since philosophy aims at making the reality we have experience of intelligible to us, its method must somehow be related to our way of thinking, i.e., it must in a way be anthropocentric. Anthropocentrism, Gilson reminds us, is not a weakness; it is a strength of the Aristotelian method: the epistemic character of philosophical knowledge is relative to us and to our cognitive modalities.

When we come to the realm of living things which we have experience of, we can notice, according to Aristotle, that living things are made of heterogeneous parts, the organs which need to work in a coordinated manner in order to carry on living activities. How can we account for the existence of such entities? Aristotle reviews the kind explanation given by the first, naturalistic philosophers: these tried to account for organisms by finding out their constitution, namely, by describing the parts they are made of and the mechanical interactions among them. Aristotle found this solution unsatisfying, since that kind of explanation applies also to things which are homogeneous, and hence it leaves “deliberately unexplained the heterogeneity of the heterogeneous.”¹³ The problem, which Aristotle faces, is expressed by the question “how does nature produce beings made up of heterogeneous parts?”¹⁴

In order to address this question, Aristotle employs the above mentioned anthropocentric methodology and asks himself if any example of production of things made of heterogeneous parts is familiar to us: if he could find one, he could then check whether that manner of production could shed some light on the case of natural organisms too, via analogy. He claims that the example of production which is the clearest to us is that of an artisan who produces a tool: a tool is composed of heterogeneous parts constituting a whole with a proper order and a proper way of functioning, and it is in this respect analogous to an organism. In the case of the tool, the heterogeneous parts are heterogeneous in order to fulfil different functions, contributing to one end which is the proper functioning of the whole. It is for that purpose that the artisan has organized the parts in that particular way. Then, the end of the tool, its proper functioning, is what explains the heterogeneity of the parts, and to that extent it is a cause of the thing, a final cause. This pattern of explanation can be applied analogically also to living organisms: like in the case of artefacts (tools), the end of the tool, its final cause, is needed to account for the heterogeneity of its parts, also in the case of a living organism its proper functioning, i.e. its final cause, explains its having heterogeneous parts.

Gilson notices that Aristotle does not take the analogy further, and he does not say more about what the final causes of living things are, nor that they require something analogous to the artisan. This seems to leave us with the possibility of unconscious final causes and this may strike us as mysterious. Gilson does not press the issue further, but we could ask ourselves how we can conceive such final causes. In the case of artefacts, the final cause could be in the temporally antecedent conditions of the artefact, i.e. it can figure as the content of a mental state of the artisan. But how can a final cause of a living organism be in the antecedent conditions of the living organism? And if it exists somehow in the antecedents of the organism at all, should there be a mind with that cause as content? And if so, why does Aristotle not speak about a mind, e.g. about an artisan of the whole nature? We can only speculate.

At other points, Aristotle recognizes procreation as a way of passing on a form without it being the content of a state of mind which shapes the action leading to the realization of that form in the product.

11 Etienne Gilson, *From Aristotle to Darwin and Back Again. A Journey in Final Causality, Species, and Evolution* (Ignatius Press, 2009), 19. The original French edition is from 1971.

12 *Ibid.*

13 *Ibid.*, 8.

14 *Ibid.*, 9.

Given the link that in his view exists between final and formal causes, maybe he thought that this could also explain final causes. If so, one cannot be sure that a certain final cause — only *qua* final cause — requires consciousness of the end to be reached. If we accept this possibility, we cannot press the analogy with the artisan further. In analogical thinking, we can assume only that degree of similarity between the well-known case and the case which is only partially known and which has to be explained, which is relevant to account for the known similarities between the two cases. In the case of living organisms, we can assume that there are final causes of organic heterogeneity as there are final causes of artificial heterogeneity, but we cannot say more than that about those final causes. The fact that the analogy cannot take us further, however, cannot be a reason to overlook the conclusions to which it can lead us. As Gilson remarks: “the notion of a teleology without consciousness and immanent in nature remains mysterious to us. Aristotle does not think that this should be a reason to deny its existence.”¹⁵

The fact that Aristotle does not take the metaphor of the artisan further suggests that he would have probably thought that some teleological arguments for the existence of God which would become popular later in history are rather too quick. As it is well known, in his *Metaphysics* he supported the view that there must be a first cause, which is thinking and immaterial, and which has the role (also) of final cause. But he reached that conclusion *in his metaphysics*, i.e. while trying to explain being *qua* being. In his philosophy of biology he deals with living things, and our experience of living things leads us to recognize final causes, not the existence of a first unmoved mover which thinks. This is an important point, according to Gilson: it shows that according to Aristotle philosophy of life has a certain independency. It deals with some features of some parts of experience and seeks principles which make those parts understandable, but that is not to say that further questions cannot be asked — by considering wider portions of experience — and further conclusions cannot be reached. So, on the one hand philosophy of life is independent from other branches of philosophy and seeks principles which have only to make life intelligible; on the other hand, the independency of philosophy of life does not imply a total segregation of this branch of philosophy from others.

Gilson stresses that Aristotle’s recognition of teleology in the philosophy of life does not rely, nor by itself necessarily implies, that there must be a living force, like Plato had thought (vitalism), or that there must be an intelligent first cause of the universe, like a metaphysician can attempt to show:

The problem of natural teleology poses itself in this way. It should be resolved in its own terms, without reaching beyond it. Assuredly, other problems may then present themselves, but only if one agrees first on the existence of natural teleology.¹⁶

With the rise of modern philosophy, Gilson notices, there was a change in the frame of mind of philosophers, and this eventually led to the scientific revolution. Contemplation of truth and beauty was no longer the main aim of investigation, as it had been for Aristotle. Indeed, Aristotle’s interest in final causes also had something to do with the contemplation of the beauty of living organisms, insofar as final causes are important in the explanation of the coordinated working together of the parts of living organisms. This coordinated working together can be called beautiful. When, at the dawn of modernity, philosophers started having a more practical aim in their investigation, they started also disregarding final causes, Gilson argues. Discussion of formal and final causes was banned and teleology abandoned, and people concentrated only on mechanical causes, i.e. Aristotelian material and efficient causes. As a result, the simple presence of teleology in nature lost its evidence:

The pure mechanist in biology is a man whose entire activity has as its end the discovery of the “how” of the vital operations in plants and animals. Looking for nothing else, he sees nothing else, and since he cannot integrate other things in his research, he denies their existence. This is why he sincerely denies the existence, however evident, of final causality.¹⁷

15 *Ibid.*, 13.

16 *Ibid.*, 17.

17 *Ibid.*, 14.

The end result was the oblivion of teleology in modern thinking, both in the sciences and in philosophical reflection.

III. DARWIN AND THE RETURN OF ARISTOTELIAN TELEOLOGY

The oblivion of teleology can finally come to an end thanks to the theory that allowed for the fullest ever account of life — including the origin of species — without appeals to final causes, Darwin's theory of natural selection. This remarkable claim can be seen as the through-line of Gilson's book, which tries to establish that teleology is a non-eliminable and non-renounceable feature of the realm of living organism. The very scientific success of Darwin, in Gilson's eyes, shows that some features of reality raise philosophical questions that science cannot answer, and this calls for the birth of a "biophilosophy" akin to that initiated by Aristotle.

Gilson's account of Darwin's approach to teleology is historically well grounded and offers important insights, which are relevant both from a historical and a theoretical point of view. He offers a brief but focused sketch of the history of the treatment of the problem of the origin of species, from antiquity, to the fixistic position of Linnaeus, to the ambivalent and hardly consistent account of Buffon, and finally to the transformistic conception of Lamarck.¹⁸ The historical overview allows Gilson to set the exact theoretical frame in which Darwin found himself arguing against the creationist account of speciation (i.e., the view held by people like the geologist Lyell and Darwin's Cambridge mentors, as I mentioned in section 1). Creationism about the origin of individual species was not a majoritarian view at all, in Darwin's times, nor was it an essential feature of the leading scientific accounts of speciation which immediately predated his theory. Although Gilson did not mention this point, we now know that Creationistic theories of speciation might have been widespread among Cambridge theologians,¹⁹ and, as Gilson recognizes, they were certainly the object of the polemical attacks of philosophers like Spencer and Huxley, who supported Darwin and whose anti-Creationism about speciation he approved. But, Gilson shows, they did not represent the majority view in the theoretical landscape of naturalism. Gilson notices the strange fact that, a few years after the first publication of the *Origin*, in a passage of *The descent of man*, Darwin, "himself, surprised by the rapid disappearance of creationist theory in his vicinity, [...] felt the need of convincing himself that it had been formerly as widespread as he had thought."²⁰

On Gilson's account, Darwin's overestimation of the importance and diffusion of theories of creationist speciation is a symptom of his attitude towards the concept of evolution, and this attitude is telling for the intellectual significance of his scientific work. Let us consider these two points in turn. Darwin found himself arguing against creationist speciation theories, together with Wallace, with Huxley but also with other non-scientists, like the philosopher Spencer: "they were at least unified by a common conviction which made of them a sort of doctrinal party and conspirators against a common enemy. Some, such as Thomas Huxley, were pleased to think of it as such; other, such as Darwin himself, gave the matter much less thought."²¹ Gilson shows that the concept of *evolution* was a key-concept in the anti-creationist battle. Through a rich grounding of his claims on textual evidence, Gilson shows that the word 'evolution' did not appear in the first editions of the *Origin*, and started appearing only in later editions. Darwin was initially only interested in the origin of species through natural selection and in countering creationist speciation theories. At some later point, Darwin speaks as if evolution was his target from the beginning, but at the same time he advances outspoken reservations about Spencer's notion of evolution.²² A theory of evolution was indeed put forward by Spencer and it took the form of a standard anti-creationist world-view. Darwin's idea of natural selection could fill an important part

18 *Ibid.*, 38-58.

19 Mayr, *One long Argument*, Ch. 2

20 Gilson, *From Aristotle to Darwin*, 68.

21 *Ibid.*, 65-66.

22 *Ibid.*, 81.

in that theory and Spencer used it for that purpose. Later — Gilson quotes the entry “Evolution” in the 1878 edition of the *Encyclopaedia Britannica* — Huxley could describe the origin of the theory of evolution as a joint project of Darwin, Wallace, Spencer and Haeckel. This understanding was fueled by the very son of Charles Darwin, Francis, who emended some revealing passages of Charles’s autobiography and who interpreted some of his father’s claims about the descent of species as claims about evolution.

According to Gilson, this is the creation of a myth, which confuses three different issues which should instead be kept separated: natural selection, the change of species by descent (i.e., anti-creationism about speciation) and evolution. The former two are genuinely Darwinian, scientific concepts. The latter is a philosophical world-view, which offers an anti-creationist account of the whole universe, not only of speciation. Although Darwin at some point started using the word ‘evolution’ as identifying the anti-creationist battle in the problem of speciation, he never argued for or committed himself to the worldview which goes by that name.

As I mentioned, in Gilson’s reading, the attitude of Darwin towards evolutionism is telling for the intellectual significance of his scientific work. Gilson points his attention to a passage of Darwin’s *Autobiography* which was emended by Francis but was later restored by Nora Barlow. Here Darwin refers to the work of Spencer, the philosopher who defined organic evolution as “an integration of Matter and dissipation of Motion, which may be, and usually is, accompanied by other transformations of Matter and Motion.”²³ After praising Spencer for his interesting conversation and for his philosophical reputation Darwin writes:

I am not conscious of having profited in my own work by Spencer’s writings. His deductive manner of treating every subject is wholly opposed to my frame of mind. His conclusions never convince me: and over and over again I have said to myself, after reading one of his discussions, —“Here would be a fine subject for half-a-dozen years’ work.” His fundamental generalizations (which have been compared in importance by some persons with Newton’s laws!)—which I daresay may be very valuable under a philosophical point of view, are of such a nature that they do not seem to me to be of any strictly scientific use. They partake more of nature of definitions than of laws of nature. They do not aid one in predicting what will happen in any particular case. Anyhow they have not been of any use to me.²⁴

This passage is revealing of Darwin’s interests and intellectual approach. He is a genuine scientist, interested in what can be found out through observation and inductive generalizations (“laws of nature”), not in general overviews of the world, nor in philosophical arguments accounting for the whole of reality at once. As Gilson points out, Darwin is assertive about what he took his scientific achievements to have actually proven, i.e. that there is natural selection and that it leads to the change of species by descent, not by creation. However, he is also extremely prudent about the philosophical significance of those scientific results.

The prudence of Darwin toward philosophical, all-encompassing views of reality can be deduced — Gilson convincingly argues — from his agnosticism in religious matters. Once a Christian believer, he started doubting theism after discovering the possibility of explaining the change of species via natural selection. Although he was committed to anti-creationism about the change of species, however, he never took a definitive stand about the origin of the whole of reality in which speciation via natural selection occurs. Such definitive stands about the whole of reality were not the reasons for his interest in science, as we have seen: “absolute positions went against the grain of his nature.”²⁵

We can now come to the conclusive point: Darwin’s attitude towards teleology. His philosophical neutrality and his genuine scientific outlook on nature allowed him to recognize the presence of teleology in nature, along lines which remind us of Aristotle. Gilson points to passages in which Darwin describes the beauty of orchids and birds. He delights in the admiration of colors, but also in the recog-

23 Herbert Spencer’s *First Principles* (Fourth edition: Appleton & C., 1898), 315. The passage is quoted and commented in Gilson, *From Aristotle to Darwin*, 80.

24 Charles Darwin, *The Autobiography of Charles Darwin, 1809-1882* (Collins, 1958), 108-9. The passage is discussed in Gilson, *From Aristotle to Darwin*, 81.

25 *Ibid.*, 65.

inition of structures of organisms which suggest a means-to-end purposiveness: adaptations. In Gilson's interpretation,²⁶ all those passages suggest a recognition of teleology in nature, a recognition which Darwin made explicit when he subscribed to a statement with which Asa Gray, in an article published in *Nature* in 1874, credited him with the reintroduction of teleology in natural sciences.²⁷ Gilson underlines that the recognition of teleology by Darwin, naturally, was disjoint from any implications concerning alleged intentional causes of teleology. Darwin actually always denied such implications: that is the main point shown by his scientific achievements. Gilson hence describes his view as "teleology without final causes." The important point, though, is that Darwin, despite his exceptional observational capacities and the scientific outlook of the descent of species by natural selection, was still able to recognize the widespread presence of teleology in nature and the remarkable beauty generated by teleology.²⁸

A brief conclusion concerning Gilson's stand on Darwin is now appropriate. According to Gilson, Darwin's scientific achievements showed that speciation can be explained through natural selection, and hence no creationist explanation of it is required. At the same time, he also showed that the recognition of teleology in nature is compatible with the new scientific world-view. The teleology present in nature, though, does not imply the existence of final causes in the sense of the intentional action of agents which bring about the particular teleological structures of adaptations. The truth of speciation by natural selection does not have immediate evident implications about the origin and nature of the universe as a whole. In this way, the theory of natural selection of Charles Darwin leaves the philosophical problems of the explanation of the origin of the universe and of its teleological structure open. Darwin's very scientific success suggests that teleology is a fact of nature that cannot be overlooked, a fact that calls for a philosophical, not a scientific account.

In the following chapters, Gilson shows that the philosophical problem of teleology has been taken on by philosophers (like the French philosopher Henry Bergson) and by scientists (like the German-American physicist and biologist Walter Elsasser) who came after Darwin and started their reflections on the basis of his conclusions. The final assessment of the discussion of teleology following Darwin convinces Gilson that the facts of nature that had struck Aristotle and the limits that Aristotle had pointed out in purely mechanical explanations still trouble the minds of post-Darwinian thinkers. This calls for a reassessment of Aristotle's methodology in the philosophy of nature: i.e., what we seem to need is a form of philosophical, rather than purely scientific, consideration of teleology in nature. And this is a project which, according to Gilson, has to be kept well separated from theology, even natural theology. Gilson lays out with much elegance the thesis of his book in the very first page of the introduction:

The object of the present essay is not to make of final causality a scientific notion, which it is not, but to show that it is a philosophical inevitability and, consequently, a constant of biophilosophy, or philosophy of life. It is not, then, a question of theology. If there is teleology in nature, the theologian has the right to rely on this fact in order to draw from it the consequences which, in his eyes, proceed from it concerning the existence of God. But the existence of teleology in the universe is the object of a properly philosophical reflection, which has no other goal than to confirm or invalidate the reality of it.²⁹

In the next section I will take a closer look at some of the conclusions that Gilson draws from his interpretation of Darwinism and that call for the development of a new philosophy of nature akin to that which Aristotle had proposed in his times. Those conclusions are in my view relevant in the current debates I have sketched at the beginning.

26 *Ibid.*, 97-98.

27 Asa Gray, "Charles Darwin: a Sketch," in *Nature*, 4 June 1874. For Darwin's reply, see Gilson, *From Aristotle to Darwin*, 99-100.

28 See Gilson, *From Aristotle to Darwin*, 24, where Gilson collects and comments on Darwin's remarks on beauty.

29 *Ibid.*, 1.

IV. THE AUTONOMY OF TELEOLOGICAL EXPLANATIONS OF NATURE

The importance of the book by Gilson that I have discussed is not only historical but also, and particularly, theoretical, as I mentioned above. In his view, after the great achievements in biology by Darwin and his understanding of the change of species by descent, we need a new philosophical assessment of the teleology exhibited by living organisms and for this task the methodology deployed by Aristotle in addressing the problem in the face of the science of his time can still be useful.³⁰ I will here recall some of the conclusions about the philosophy of nature that Gilson could come to through the analysis of Aristotle's and Darwin's views, which I have just presented. I will briefly focus on three points, which I believe to be relevant for the discussions about teleology that I have mentioned at the beginning: i. Gilson's claim that teleological explanations are needed since teleology is common; ii. his claim that teleological explanations are not a part of or a kind of scientific explanation; iii. his suggestion that teleological explanations in the philosophy of nature are explanatorily independent from consequences that teleology might have in other areas of philosophical inquiry (ethics, aesthetics, and natural theology).

Let us begin with the first point. Darwin — with his theory of natural selection — found a way to account for the existence of organic wholes which allows for the existence of organization and functional parts in those wholes to be thought of in their own terms. By this, I mean that the organization and the functional arrangement of the parts of these wholes can be thought of without reference to further facts, such as the intention of a designer or the presence of a special vital force. In this way, however, teleology can go back to the status it already had for Aristotle: it is an evident feature of the objects of our experience:

There is no difference between asking oneself what the function of an organ is, that for which “it is useful,” and asking what its end is. [...] To the extent that we invoke it to give an explanation of this fact, teleology is the object of sensible experience, not in itself but in its effects. This is a question, not of an abnormal or exceptional case but, on the contrary, of one of those numerous cases where in sensible experience itself an immediate inference is produced in the intellect from the perceived effect to the cause.³¹

Gilson's point here is that organisms fill our experiential space in, and that means that teleology fills our experiential space in, since teleology is a feature of organisms that our intellect immediately grasps in our experience of organized objects. That a heart has the function to pump blood in the organism to which it belongs is a fact which we can empirically access, and the fact that the end for which that heart exists is pumping blood is a truth that we can immediately grasp when we experience that the heart is pumping. Hence, teleology is as widespread a phenomenon as is the presence of organisms.

This conclusion brings us to the second point. The fact that teleology is implicit in our experience suggests that we do not grasp it by grasping *sui generis* facts, different from “scientific facts.” Teleology is the result of recognizing organized wholes present in the reality of our normal experience and of asking how they came about. Awareness of them derives from the same reality that scientists also experience. However, the recognition of teleology results from the additional question about the origin of these organized wholes. This suggests that biophilosophy (to use Gilson's term) and biosciences do not differ in their extension (living organisms in both cases), but in the questions they ask about the objects of the extension, and the methods they use for answering those questions.

In brief, if there is in nature at least an apparently colossal proportion of finality, by what right do we not take it into account in an objective description of reality? It is there, let us recall, that, according to Aristotle, the heart of the matter lies. If the scientist refuses to include final causality in his interpretation of nature, all is in order; his interpretation of nature will be incomplete, not false. On the contrary, if he denies

³⁰ In recent times, the need expressed by Gilson has been acknowledged and researchers are starting to move in that direction, both coming from the natural science and from philosophy. See, for example, the work of a biologist: Terrence Deacon, *Incomplete Nature: How Mind Emerged from Matter* (Norton & C., 2011), especially Ch. 9. For a philosophical take on this line of thinking, see Alicia Juarero, *Dynamics in Action: Intentional Behavior as a Complex System* (MIT Press, 1999) and Evan Thompson, *Mind in Life: Biology, Phenomenology, and the Sciences of Mind* (Harvard University Press, 2007).

³¹ Gilson, *From Aristotle to Darwin*, 146.

that there is final causality in nature, he is being arbitrary. To hold final causality to be beyond science is one thing; to put it beyond nature is completely different. In the name of what scientific principle could one exclude from a description of reality an aspect of nature so evident? Explanations which rely on final causality have often been ridiculed, but mechanistic explanations have been ridiculed also, and this does not disqualify the legitimacy of either point of view.³²

Hence, philosophy and science have quite different tasks, and one cannot deny the existence of the features of reality the other takes into account to answer its questions.

In this connection, at several points, Gilson recalls the Aristotelian doctrine of the four causes, which are four different ways of explaining a fact. Science — in the strict sense that the term acquired during modernity — seeks a mechanistic explanation, i.e. an explanation based on the material and the efficient causes. Gilson claims that there is nothing wrong in seeking an explanation of this sort, but he claims also that an explanation of that sort is incomplete. We can explain why an object *o* came into existence by finding out about the matter and the manufacturer of *o*. But we can also ask about the end for which *o* was made. And this sort of question seems to be legitimate also in the case of natural organs, like the heart. As Gilson claims,

natural science neither destroys final causality nor establishes it. These two principles belong to the philosophy of the science of nature, to that which we have called its “wisdom.” What scientists, as scientists, can do to help clarify the problem of natural theology is not to busy themselves with it. They are the most qualified of all to keep philosophizing about it, if they so desire; but it is then necessary that they agree to philosophize.³³

Science seeks mechanical explanations and hence should not worry about teleological explanations, but that does not mean that science can deny the legitimacy of final explanation either. If its business is mechanical explanation, how can it have anything to say at all about other possible forms of explanation?

Gilson argues also that, since more explanations of the existence of organisms are possible, they should all be accepted:

nothing prevents the two points of view [i.e., mechanical and teleological explanations] from coexisting, and if their peaceful coexistence is possible, it is desirable. A half-truth is never worth a whole truth, and, in fact, these two parts of the truth have coexisted, even after Bacon, in scientific minds far superior to his, and even after Descartes, in geniuses who were certainly not inferior to him.³⁴

The point here is that if we can look at the same facts and offer both a mechanistic and a teleological explanation, and if there is no contradiction between these two explanations as such, both explanations should be sought.

We come now to the third and final point. Gilson stresses the autonomy of teleological explanations in biophilosophy and their independency from the role that the existence of teleology in nature (even in organic reality) might have for other fields of philosophy, like ethics, aesthetics and (natural) theology. The fact that organisms have *tele*, for example, might be relevant for our ethical discourse and for our philosophical reflection on them, but that relevance is settled by ethicists in their own right, not by natural philosophy. Biophilosophers might account for the existence of teleology in the organic world, and ethicists will have to discuss how those results might be relevant for their field: it is not as if ethics or metaethics can establish what exists in the natural order. Similar observations can be made also for aesthetics and natural theology. Missing this point can lead to methodological confusion, according to Gilson:

When the moment arrives for [theologians] to search out whether final causes have as their origin divine thoughts and intentions, the philosopher of nature will have decided long ago about their existence on the basis of facts drawn from the observation of nature herself. The biophilosopher is not a theologian. [The] mixture of theology and philosophy of nature has exercised a disturbing influence on the history of teleology.³⁵

32 *Ibid.*, 31.

33 *Ibid.*, 20.

34 *Ibid.*, 30.

35 *Ibid.*, 142-143.

Gilson goes on to argue that the problem with mixing disciplines is that it is not clear what the order of explanation is: philosophers, for example, end up bringing into the discussion concerning teleology considerations about the intention of a Creator, whereas the priority of explanation lies on the side of biophilosophy which should, in case, offer insights about the structure of reality that a natural theologian could use to argue that there is a Creator.

As I mentioned, these points, which Gilson made in his book by relying on an Aristotelian methodology for the study of nature, can be relevant for the current debates about Neo-Darwinism and teleology that I have introduced at the beginning. What their relevance is will be the topic of the last, conclusive section.

V. THE LEGITIMACY OF TELEOLOGICAL EXPLANATIONS

As I mentioned in the opening section, in current debates on evolutionism and ethics two main parties counter each other: on the one end, debunkers of morality take evolutionary theory to have shown that there are no objective values in the world, and, hence, morality to be illusory; on the other hand, moral realists (Nagel being the main example), have argued that it is true that the neo-Darwinian picture of the world implies that morality is a pure illusion, but, since we have independent, solid grounds to be moral realists, this only sheds doubts on the neo-Darwinian world-view via *modus tollens*.³⁶ According to Nagel, we need to reconsider the neo-Darwinian picture and this calls for a new role for teleology in science. Gilson's reflections on biophilosophy are interesting in this connection since they suggest ways in which this debate could be rephrased in order to seek a solution.

The arguments supported by Gilson suggest, in the first place, that debunkers of morality probably overlook the autonomy of biophilosophy when they claim that evolutionary theory has proven that there are no moral values. If we recall Gilson's argument for the mutual independency of biosciences and biophilosophy, we can claim that the neo-Darwinian synthesis can at most prove what mechanisms led to the formation of organisms such as us, but it cannot prove anything about our teleological structure. That structure will be the exclusive object of the consideration of philosophers of life. Furthermore, whether our teleological characteristics to be found out by biophilosophers are or are not compatible with moral realism will be a further object of investigation for ethicists, not for scientists or for philosophers of life.

Debunkers of morality seem to confuse these matters: since from a scientific point of view no sense can be made of claims concerning the existence of value, then values should be ruled out from the furniture of the world. However, Gilson could rightly counter that science seeks mechanistic explanations of the objects of its investigations, and values cannot be found out in that way. Claiming that values do not exist since science can make no sense of them is like claiming that scientific, mechanistic explanations should be absolute, the only possible form of explanation. But we have seen that mechanistic and teleological explanations can coherently coexist, and hence they should be both accepted. The problem here is not with Neo-Darwinism as a form of scientific theory, but with the world-view which takes the Neo-Darwinist form of explanation to be exclusive and which rules out all other forms of explanation, e.g. teleological explanation.³⁷

In this respect, the reaction of Nagel against debunkers of morality seems proper: if a view (in this case, the neo-Darwinian world-view) implies that there is no value, but we have strong independent reasons to think otherwise, we should revise the view having that implication. However, Nagel thinks also that we should substitute the New-Darwinian picture with a new scientific picture, which takes teleology also into account. If teleology plays such an important role in nature, a new scientific image of

³⁶ As mentioned above, Joyce, *The Evolution of Morality*, and Street, "Darwinian dilemmas" support evolutionary moral anti-realism, whereas Nagel, *Mind and Cosmos*, criticises it.

³⁷ The pervasiveness of teleological explanation in human thinking has lately been an object also for empirical investigation, e.g. in cognitive science. For a philosophical outlook on the relevance of those results for the relations between science and theology, see Brian Green, "Teleology and Theology: The Cognitive Science of Teleology and the Aristotelian Virtues of *Techne* and Wisdom," *Theology and Science* 10, no. 3 (2012).

the world should take that into account too, in his view. We need a new science, with a new method, although we cannot even imagine what it will look like. The arguments offered by Gilson counter also this line of thinking: teleology, as we have seen, is not a *sui generis* fact that current science cannot recognize and that a new science will be able to capture. Teleology is a property of common facts, but a property that we can be sensitive to only if we ask certain questions, i.e. only when we seek certain forms of explanation. When we seek only a mechanistic explanation — and this is what science does because of its very nature — we are not able to grasp teleology. Rather than thinking about a new science, which we have no idea what it should look like, we should clarify the distinction between science and other forms of knowledge (i.e. philosophy), between mechanistic and other forms of explanation.³⁸

In this way, Gilson's points suggest a line of argumentation which avoids the direction taken by the debunkers of morality, but resists Nagel's developments at the same time. Nagel is preoccupied with the idea that a reintroduction of teleology might bring theistic perspectives into the discussion. Hence, he seeks a naturalistic way of reintroducing teleology, a perspective which sees teleology as a natural fact, and — in his view! — this can only happen if teleology can be studied by science. Paradoxically, this brings him close to supporters of intelligent design, such as Michael Behe, whom he rehabilitates.³⁹ He notices that if there are irreducible functions, like many scientists seem to conclude, Behe must have a point in claiming that mechanism cannot explain everything, and hence teleology must be proven by science.⁴⁰ The only point of divergence between him and Behe, then, is how to interpret that teleology.

Gilson's appeal to the Aristotelian methodology, by contrast, suggests that science is by its nature based on mechanistic explanations and, hence, it cannot account for teleology at all. When a mechanistic explanation is not available for a certain phenomenon, by this token, we cannot thereby immediately conclude that the phenomenon is of a *sui generis* kind, that it proves the existence of non-mechanical parts of reality. Rather, the methodological assumptions of scientific research should make us conclude that a mechanistic explanation of that phenomenon is still missing due to our epistemic or theoretical limitations, and our efforts should be strengthened in order to find out the hidden, unknown mechanism. Science cannot prove the existence of a "God of the gaps" (gaps of scientific explanation, of course), nor can it disprove it. Science cannot even prove or disprove the presence of teleology or the existence of values. When we presume that this can be done, we are making at some point a category mistake about the nature of explanation. Similarly, science cannot include teleology as an object of its investigation, since, by its nature, science looks for mechanism, and cannot but overlook final causes.

Gilson can take this move, since he is free from Nagel's preoccupations about theism. This is the case not only because Gilson is not a committed atheist, like Nagel, but, more simply, because, from the standpoint of his Aristotelian conception of the sciences, Gilson can reject the equivalence between 'natural' and 'object of science', that Nagel seems to assume. According to Nagel, if teleology has to be part of reality, it has to be part of nature (since he denies the supernatural), and that, to him, means that it must be a possible object of scientific investigation. As we have seen, instead, Gilson thinks that we can ask different sorts of questions about the same natural reality: how a certain feature of that reality came to be, and for what reason it came to be. The former kind of question can be answered through mechanical causes, the latter through final causes. Hence, in his view, we do not need to include teleology among the objects of scientific investigation, and teleology can still be a perfectly natural fact.

In this way, Gilson's retrieval of Aristotle's methodology suggests important ways in which different issues which are confused in the current debate should be kept separated and dealt with independently from each other. In sum, it seems to me that the Aristotelian methodology suggests ways in which the order of explanation in the current debate can be improved: if those improvements are implemented, teleological explanations can be reestablished as a legitimate form of explanation. Firstly, teleological explanation should be independent from scientific explanation: it should be a philosophical form of

38 Ian Barbour, *Religion in an Age of Science* (Harper and Row, 1990) argues for a similar point.

39 Nagel, *Mind and Cosmos*, 10.

40 Michael Behe, *Darwin's Black Box* (Free Press, 1996).

explanation dealing with the same objects investigated by the biological sciences, and hence it should be informed by what the biological sciences find out. However, it should ask questions rather different from those asked by biological sciences. In answering those questions, the sciences cannot give a final word. Secondly, teleological explanations of living things should be prior to theological and ethical explanations: what teleology can explain about the realm of living things does not depend on theological or meta-ethical accounts of teleology, but, in case, it is the other way around: what natural theology and meta-ethics can say about teleology⁴¹ will have to rely on conclusions already reached in the sphere of the philosophy of life.⁴²

The main through-line of this essay is that mechanistic (scientific) and teleological (philosophical) explanations can coherently coexist, and, hence, that they should be both accepted, since Darwin's mechanistic account of final causes has disentangled teleology (the existence of ends in organisms) from final causation (i.e., the idea that the ends of organisms were brought about intentionally by an agent). A reader could wonder whether the Darwinian account is not in fact reducing teleology to mechanistic causes, thereby making mechanical explanation more fundamental. Then, the specificity of the teleological explanation would not capture any particular ontological category. Against this worry, I would reply that Gilson's arguments are probably meant precisely to immunize us from this reductivist tendency. His claims about the autonomy of biophilosophy are meant to show that teleology is a fundamental feature of our way of thinking about organisms and that the principles of teleology have to be settled prior to and independently from any commitment to a particular metaphysical view, e.g. mechanisticism rather than causal pluralism, or materialism rather than dualism or non-materialistic versions of monism. The only point that I wanted to make in this essay is that mechanistic explanations and teleological explanations can coexist and that a methodological pluralism in the study of life is possible and welcome. Certainly, teleological explanations cover events that can also be described mechanically, but they do so by focusing on relations between those events that would not be meaningful or significant from the point of view of a mechanistic explanation. Whether this depends only on idiosyncratic features of our ways of looking at those facts, or whether it depends on the fact that teleological explanations capture particular properties (e.g., properties which emerge from underlying properties studied by mechanistic explanation) is a further topic, which this essay does not intend to address. However, that is a topic for biophilosophy, as Gilson would say, i.e. a question that can only be asked when the specificity of teleological explanations has been acknowledged.

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41 I have dealt with some of the consequences of the recognition of teleology in nature at the levels of ethics and theology in De Anna (forthcoming).

42 A previous version of this essay was presented in German at the conference *Funktion und Normativität bei Darwin und Aristoteles — Natur als Entstehungsrahmen von Moralität?* which took place on 17 and 18 February 2014 at the Otto-Friedrich-Universität Bamberg, in Germany. The talk was subsequently published in the proceedings of that conference: Gabriele De Anna, "Nach Darwin: Aristoteles. Über die Besonderheit teleologischer Erklärungen." In *Funktion und Normativität bei Darwin und Aristoteles*, edited by Marko J. Fuchs und Annett Wienmeister (University of Bamberg Press), 217-243. I thank the participants at the conference for their comments and for the discussions. I also thank the two anonymous referees of this journal for their extremely useful comments on this essay.

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