

Article

# A Contemporary Aristotelian–Thomistic Perspective on the Evolutionary View of Reality and Theistic Evolution

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**Abstract:** This article presents a coherent and comprehensive proposal of a renewed contemporary Aristotelian–Thomistic approach to the evolutionary view of reality and the position of theistic evolution. Beginning with a proposal of a hylomorphically–grounded essentialist definition of species—framed within a broader revival of biological essentialism—a constructive model of the Aristotelian–Thomistic metaphysics of evolution is being offered, together with a reflection on the alleged violation of the principle of proportionate causation in evolutionary transitions and the role of teleology and chance in evolution. The theological part of the article addresses a number of questions concerning the Thomistic school of theology in its encounter with the evolutionary worldview, including the question of whether God creates through evolution, the query concerning the concurrence of divine and created causes in evolutionary transitions, and the question regarding evolutionary and theological notions of anthropogenesis. A list of ten postulates grounding a contemporary Thomistic version of theistic evolution is offered as a conclusion to the research presented in the text.

**Keywords:** anthropogenesis; Aquinas; Aristotle; chance; creation; divine action; evolution; hylomorphism; proportionate causation; speciation; teleology; theistic evolution



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## 1. Introduction

The question concerning an Aristotelian–Thomistic response to the theory of evolution has been an object of research conducted by a number of thinkers coming from and continuing the classical school of thought in philosophical theology. Following the development and transformation of evolutionary theory throughout its history, they commented on more speculative—philosophical and theological—repercussions of Darwin’s view of nature.<sup>1</sup> I believe that the most recent changes in the evolutionary paradigm—grounding the extended evolutionary synthesis—provide a suitable background for a new chapter in the conversation engaging evolutionary biology, the philosophy of biology, metaphysics, and the Christian theology of creation. Past strongly reductionist, anti-teleological, and anti-essentialist views of species transformism—on the one hand—and theological interpretations of evolutionary theory leaning toward panpsychism and pan(en)theism—on the other hand—we seem to face an opportunity for developing a multidimensional, open-minded, and comprehensive account of evolutionary theory, one that remains in line with and benefits from a reference to the categories of classical metaphysics and Aquinas’s notion of God and divine action in the universe; one that is potentially attractive also to readers who do not have any prior commitment to Thomism.

Over the last several years of my academic research and writing, I addressed various aspects of the interdisciplinary dialogue between science, philosophy, and theology related to the theory of evolution (see [Tabaczek 2014, 2015, 2019b, 2020, 2022, 2023a](#)). Toward the end of the year 2023, Cambridge University Press published my monograph, in which I bring together, rethink, extend in various degrees, and organize this material into a coherent and comprehensive proposal of a renewed contemporary Aristotelian–Thomistic approach to the evolutionary view of reality and the position of theistic evolution (see

Tabaczek 2024 [copyright date of publication]). The present article offers a condensed version of the main arguments presented in the book, with several minor yet important further clarifications, developments, and answers to some of the first responses to the arguments presented in it.<sup>2</sup>

The first part of the article concentrates on the notion of biological species. Beginning with a proposal of a hylomorphically-grounded essentialist definition of species (Section 2.1), framed within a broader revival of biological essentialism (Section 2.2), I emphasize the dynamic aspect of this concept of species (Section 2.3) and juxtapose it with a more general, including non-essentialist, views of species in biology (Section 2.4).

The second part of the article offers a hylomorphic model of the metaphysical aspects of species transformism. It proceeds from the analysis of the notion of disposition of matter and levels of potentiality (Section 3.1) and the notion of the tendency of matter for ever higher perfection (Section 3.2). Its central part consists of a constructive proposal of the Aristotelian–Thomistic metaphysics of speciation (Section 3.3), followed by the reflection on the population *versus* individualistic/typological notion of the units of speciation (Section 3.4), levels of similarity of adjacent biological species (Section 3.5), the alleged violation of the principle of proportionate causation in evolutionary transitions (Section 3.6), and the role of teleology and chance in evolution (Section 3.7).

The third and final part of the article addresses a number of questions concerning the Thomistic school of theology in its encounter with the evolutionary worldview. Beginning with Aquinas’s notion of creation (Section 4.1) and his use of Augustine’s category of *rationes seminales* (Section 4.2), it suggests a move from Augustine’s gradualism to evolutionism (Section 4.3) and offers a reflection on some of the central theological topics concerning evolution. These include the question of whether God creates through evolution (Section 4.4), the query concerning the concurrence of divine and created causes in evolutionary transitions (Section 4.5), and the question regarding evolutionary and theological notions of anthropogenesis (Section 4.6). As an outcome of this reflection, the third part of the article concludes with a reconsidered and updated list of ten postulates grounding a contemporary Thomistic version of theistic evolution.

## 2. Biological Species

In order to speak about the evolutionary transformation of species, we need to begin with the very category of species. Apart from the centuries-long controversy concerning nominalism *versus* realism about species as a universal category, those in support of the realist stance face the complexity of the debate on the definition of biological species.<sup>3</sup> This debate has been going on for decades, and its subject remains probably the most controversial issue in contemporary biology and the philosophy of biology.<sup>4</sup> Approaching it from the Aristotelian–Thomistic perspective, I propose the following hylomorphically-grounded essentialist definition of species.

### 2.1. Hylomorphically–Grounded Essentialist Definition of Species

- (1) Biological species is a universal category expressed in and abstracted from concrete living beings that are determined by a particular type of essence;
- (2) The latter is constituted by a specific kind of substantial form (SF) which—as a metaphysical principle of actuality—actualizes its correlative metaphysical principle of pure potentiality; that is, primary matter (PM);
- (3) Causing thus an organism to be what it is, SF grounds a range of essential and accidental, intrinsic and extrinsic dispositions and properties, characteristic of a given type of living creature;
- (4) A provisional list of these dispositions and properties includes particularized kind-specific morphological and physiological developmental programs and a variety of genotypic and phenotypic traits that find their distinctive expression in the historical relationships of organisms that belong to a given species.

## 2.2. The Revival of Biological Essentialism

That this definition is not indicative of some sort of dogmatic entrenchment in scholasticism and detachment from the advances of contemporary science becomes clear in light of the more recent revival of essentialism in the philosophy of biology. Indeed, a number of thinkers have challenged a radically anti-individualistic and anti-essentialistic orthodoxy, claiming that the relational approach in defining species—including biological, phylogenetic-cladistic, evolutionary, and population-structure species concepts (outlined in terms of relations among organisms in space and time)—requires at least supplementation with the alternative, more classical view—one that acknowledges the reality of the intrinsic natures (essences) of individual organisms.

Several suggestions have been made as to what should be taken to constitute an essential nature, including genetic properties, fundamental dispositions, or developmental programs. Some are willing to define essences in reference to both genetic and/or phenetic properties and relational/historical aspects of organisms, breaking thus a clear-cut boundary between the relational and the essentialist (intrinsic) schools of taxonomy. Others defend essentialism delineated in reference to the origin of a given organism (origin essentialism).<sup>5</sup> The definition provided here goes one step further, defining essences in reference to hylomorphism, i.e., as mixtures of actuality and potentiality, where the former is defined as SF and the latter as PM. Regarded as causes—on the assumption that causal principles, going beyond physical interactions, are understood as metaphysical principles explaining essences of natural kinds—PM and SF are closely related with efficient and final causes, as well as with the quasi (*per accidens*) causal character of chance and fortune.<sup>6</sup> Taken together, they ground all types of genetic, phenetic, or dispositional properties of organisms, mentioned in other variants/aspects of the essentialist species concept and listed in my definition (3–4).

## 2.3. Dynamic Aspect of Hylomorphically-Grounded Biological Essentialism

Moreover, the fact that the category of species is seen here as “expressed in and abstracted from concrete living beings”, whose kind-specific dispositions and properties are studied in their historical relationships, inspires a response to the claim that biological essentialism implies species fixism (which is, in principle, inconsistent with the view that species evolve). This accusation is based on Ernst Mayr’s popular and overly Platonic phrasing of the essentialist species concept, in which he states that according to it, “[t]here are a limited number of fixed, unchangeable ‘ideas’ underlying the observed variability [in nature], with the *eidos* (idea) being the only thing that is fixed and real, while the observed variability has no more reality than the shadows of an object on a cave wall” (Mayr 1976, p. 27).<sup>7</sup> However, one must not forget that, contrary to this view, on Aristotle’s scheme, essences or natures are not transcendental, fixed “ideas” but “goal-directed capacities immanent in the nature of the organism”. In other words, they exist as realized in concrete, temporal, individual, and contingent organisms. Hence adds Denis Walsh, “It certainly isn’t inconsistent with Aristotelian essentialism to suppose that natures could change over time in just the way we have come to think that species do. Individual organisms may well vary in their formal and material natures, in such a way that over time some variants become more common than others” (Walsh 2006, p. 431).<sup>8</sup>

In support of his argument, Walsh refers to David Balme saying that “[t]here is nothing in Aristotle’s theory to prevent an ‘evolution of species’, i.e., a continuous modification of the kinds being transmitted. But he had no evidence of evolution” (Balme 1987, p. 97). A contemporary philosopher of science, Travis Dumsday, states that “essentialism not only allows for evolution but is plausibly required for it” (Dumsday 2012, p. 390). He notes that a similar argument was already made by the scholastic scholar Richard Phillips in 1934. In his textbook on the philosophy of nature, Phillips writes: “Considering, then, natural species in the strict sense, do our principles allow us to say that they could be transformed? There seems to be nothing in them to render it impossible for we should only have a striking example of substantial change” (Phillips [1962] 2013, p. 342).

#### 2.4. Metaphysical and Biological Species Concepts

Concerning the question about the correspondence between this hylomorphically grounded essentialist (and thus metaphysical) definition of species and the notion(s) of species used in the practice of biological (and thus scientific) taxonomy, I argue that they are related, although certainly not coextensive. The correlation between them finds expression in numerous variants of the essentialist species concept that take into account structural and historical, i.e., predominantly empirical, aspects and features of living beings. These substantive and accidental (intrinsic and extrinsic) dispositions and properties may be treated as indicators of a particular kind of SF, which defines the metaphysical foundation of a given natural kind. Consequently, I believe that properly conducted interdisciplinary research in biology, the philosophy of biology, and metaphysics enables us to arrive at the situation in which a “scientific” species, as characterized by a practicing biologist, corresponds closely to the “philosophical/metaphysical” species.<sup>9</sup>

### 3. Hylomorphism and Species Transformism

The primary objective of the logic of hylomorphism, applied in the preceding section to the notion of biological species, was to provide a relevant account and analysis of the causes and mechanisms of the processes of generation, change, corruption, and decay in nature and to posit the plausible characteristics of both the changing and persistent aspects therein. This fundamental metaphysical doctrine in Aristotle’s philosophy of nature proves to be useful in an attempt to develop a constructive proposal of the Aristotelian–Thomistic metaphysics of evolutionary transitions. A point of departure in this regard is the notion of the potentiality and disposition of matter.

#### 3.1. Disposition of Matter and Levels of Potentiality

In *In Meta.* V, lect. 14 (§ 963), Aquinas states, after Aristotle, that “what is capable of being acted upon in some way must have within itself a certain disposition which is the cause and principle of its passivity”. He understands disposition as an order through which some qualities of a given thing direct it toward some other qualities (acquired in an accidental change) or becoming something entirely new (in a substantial change).

A closer analysis of the notion of potentiality in Aristotle and Aquinas enables us to say that while the pure potentiality of PM (*materia prima*) can be actualized by any logically possible SF, the type of SF actualizing PM in the case of a substantial change in which a given substance *A* (secondary matter) is replaced by another substance *B* is not random. It depends both on the SF and on accidental forms (AFs) actualizing *A*. These principles of actuality dispose *A* to enter specific accidental or substantial changes, which narrows the scope of potentialities of PM that may be actualized in a given change.<sup>10</sup> In other words, the principles actualizing entities classified as instantiations of secondary matter dispose their underlying PM in particular ways, enabling thus—in the course of substantial change—an education of particular types of new substantial forms (SFs) (typical of other natural kinds) from its potentiality. We might speak, respectively, about the “remote” and “proximate” disposition of PM.<sup>11</sup> To give an example, if you put a wooden log into a fire, it does not melt but burns and turns into a pile of ash and not, let us say, into a butterfly. Although the pure potentiality of PM underlying the log can be actualized by any SF (“remote disposition” of PM), the fact that it is currently actualized by the SF of wood and a number of AFs (e.g., color, shape, and moisture) changes its disposition and sets up a limited scope of its potentialities that can be actualized within a constrained range of substantial changes a wooden log may undergo (“proximate disposition” of PM).

What is crucial in this account is—once again—what the Aristotelian–Thomistic metaphysics understands of the term “potentiality”. It does not perceive it as the potency for a limited number of (fixed) natural kinds to unfold from the already existing secondary matter.<sup>12</sup> Rather, it sees it, ultimately, as one of the most basic metaphysical principles underlying the very fabric of the universe, a potency that may be actualized by any SF. Obviously—as noted above—PM, as such, is always actualized by a given SF, which limits

the range of possible future actualizations it may go through. At the same time, the flexibility of the dynamic processes is such that the fact that PM is informed at time  $t_1$  by the substantial form SF<sub>1</sub>, which disposes it to be actualized in the next substantial change at  $t_2$  by the substantial form SF<sub>2</sub>, while preventing it from being actualized (in the same substantial change at  $t_2$ ) by the substantial form of SF<sub>2\*</sub>, does not prevent it from being actualized by SF<sub>2\*</sub> after a number of substantial changes it may go through. They may dispose it such that, at one point, it may actually be “ready” to be informed by SF<sub>2\*</sub>.

### 3.2. Matter as Striving for Perfection—*Scala Naturae*

I claim that the two levels of potentiality that we can define within the Aristotelian–Thomistic metaphysics enable us to provide an accurate description of the dynamic and flexible character and nature of reality—one that is in line with contemporary science. Moreover, they also allow us to introduce the idea of evolutionary changes and transitions as compatible with the framework of classical metaphysics and philosophical theology—especially when referring to Aristotle’s notion of the *scala naturae* and Aquinas’s view of matter as striving for perfection. In his biological works, Aristotle comments on an apparent ascent of perfection of the beings in nature. He speaks about a gradual crescendo from nonliving, through plants and animals, to human forms: “Nature proceeds little by little from things lifeless to animal life in such a way that it is impossible to determine the exact line of demarcation, nor on which side thereof an intermediate form should lie” (*Hist. an.* VIII, 1 [588b 4–6]).<sup>13</sup> Aquinas moves this reflection further, emphasizing that the potentiality for perfection can be actualized only gradually and in accordance with some determinate order:

[E]verything capable of being generated has a definite matter from which it comes to be, because there must be a proportion between form and matter. For even though first matter is in potentiality to all forms, it nevertheless receives them in a certain order. For first of all it is in potency to the forms of the elements, and through the intermediary of these, insofar as they are mixed in different proportions, it is in potency to different forms. Hence, not everything can come to be directly from everything else unless perhaps by being resolved into first matter. (*In Meta.* XII, lect. 2 [§ 2438])

Moreover, speaking of the importance of the proper disposition of PM for particular accidental and substantial changes that a given substance may go through, Aquinas formulates an observation that might inspire a new development of the classical notion of hylomorphism, enabling it to provide a helpful metaphysical foundation for the contemporary version of the theory of evolution:

From the fact that matter is known to have a certain substantial mode of existing, matter can be understood to receive accidents by which it is disposed to a higher perfection, so far as it is fittingly disposed to receive that higher perfection. (*Q. de an.* 9, co.)<sup>14</sup>

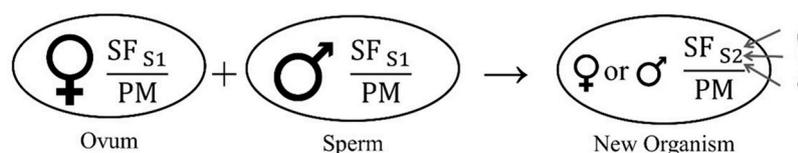
On another occasion, we find him saying that matter, properly disposed, “turns towards the act or prepares itself to receive it” (*Super IV Sent.* 49, 3, 2, co.). Once again, in his commentary on Aristotle’s *On the Soul*, Aquinas comes to a similar conclusion that “everything in a lower form of existence is inclined to the maximum possible assimilation to the higher form” (*In De an.* II, lect. 7 [§ 315]).<sup>15</sup> I believe this enables us to delineate and propose the metaphysical foundation of the mechanism of biological evolution. Here, I agree with O’Rourke, who is convinced that “If Aristotle’s metaphysical analysis of growth and change is correct, the principles of form and the affirmation of potency will hold a fortiori for the evolutionary process” (O’Rourke 2004, p. 27).

### 3.3. Metaphysics of Speciation

An evolutionary transition might be thus defined, in this account, as a series of minor genetic and epigenetic changes that effect minor phenotypic variations (accidental

changes). These variations—remaining within the range of active and passive powers typical for a given species (natural kind)—may become permanent (i.e., transmitted from one generation to the next), which, in turn, gradually changes the “proximate disposition” of PM underlying subsequent organisms of the lineage  $L_1$  of the species  $S_1$ . This process, highly complex and extended in time, might lead to a precise instant in which the PM underlying the ovum and the sperm coming from particular female and male organisms of sexually reproducing species  $S_1$ ,<sup>16</sup> at their entering the substantial change in which they join and give origin to a new organism, is not disposed to be actualized by the “old” type of SF that defines species  $S_1$  but by a “new” type of SF that defines species  $S_2$ , which is educed from the potentiality of the PM that underlies them. The new organism (or organisms, as the process described here is commonly considered to be taking place within a population) starts a new lineage  $L_2$ , which happens to be the lineage of the new species  $S_2$ .

Gametes—parental ovum and sperm—are separate entities and may be treated as instrumental causes, acting under the principal causation of the organisms that produced them (see *Q. de pot.* 3, 11, ad 5). Normally, when they join, entering thus a substantial change, which originates a new organism, the PM that underlies them is disposed to be actualized by the original SF of the type  $S_1$ . In the case of an evolutionary transition, however, accidental changes in the DNA and the epigenetic causal factors inherently affecting the phenotypes of the consecutive organisms within the lineage  $L_1$  lead to the situation in which PM, actualized by the SFs of given ovum and sperm, produced by female and male organisms of species  $S_1$ , is disposed to be actualized in the substantial change these gametes enter by a new SF of the type  $S_2$ , which is educed from its potentiality. This originates the new evolutionary lineage  $L_2$ . See Figure 1.



**Figure 1.** Hylomorphic metaphysics of an evolutionary transition.

It takes many genetic mutations and epigenetic changes (the outcomes of which are regulated by natural selection and isolation barriers) to produce such an effect (i.e., the difference in kind between parents and their offspring), and its actual instantiation may be extremely difficult (if not impossible) to capture.<sup>17</sup> But this does not exclude the possibility of its occurring, especially in a situation where some members of a species migrate to a new ecological niche where they can enter processes of gradual modification in subsequent generations to the point where they can no longer mate with the other descendants of their ancestors. Thus, it becomes clear that, even if Aristotle’s biological research was far from discovering the possibility of the transformation of species, his metaphysics, picked up and developed by Aquinas in the Middle Ages, left much room for such a possibility.<sup>18</sup>

### 3.4. Population and Individualistic/Typological Approach

The proposed metaphysical model of speciation concentrates on the individualistic and typological approach to the notion of the units of evolutionary transitions. As such, it is often portrayed as standing in radical opposition to the population thinking in biology. The latter assumes that what explains the abundance of living forms is genetic variation and the distribution of traits among organisms within populations, which are treated as basic units subject to the pressure of natural selection. As Stephen Boulter notes, “In the population thinking characteristic of evolutionary biology, to determine the effects of evolutionary mechanisms one need[s] only advert to statistical laws about the interactions of the individuals in a population. One needs no knowledge of the particular properties of particular individuals. It is only properties of populations that are truly explanatory” (Boulter 2012, p. 92). I believe that both approaches are needed and that they complement each other. In other words, the overemphasis on population thinking in evolutionary bi-

ology should be mitigated with the typological and individualistic approach. Here, I side with Oderberg and Walsh:

Genes are not ‘disembodied members of populations’ but constituents of organisms, and the fate of the genes is tied to the fate of the organisms whose genes they are. Moreover, the process of adaptive evolution is precisely the process whereby populations come to comprise well-adapted organisms. Knowledge of whether a population has evolved requires knowledge of whether adaptive traits have arisen within individual organisms. For evolution to occur, harmful mutations must be sufficiently rare or ineffectual within individuals, and fitness must be fairly constant across genetically similar individuals. Population thinking is simply not possible without individualistic thinking. (Oderberg 2007, p. 208)

Recent evolutionary developmental biology shows that one cannot understand how natural selection operating over a population of genes can lead to increased and diversified adaptation of organisms unless one understands the role of individual natures (essences) in the process of evolution. (Walsh 2006, p. 426)

Consequently, acknowledging the fact that biological speciation takes place in populations of living organisms and depends on the principles characterizing their functioning (formulated in population genetics), we should add that it is possible for us to speak about the emergence of a population of a new species only because it contains organisms that belong to (exemplify) a new natural kind. In my model of speciation, concentrating more on the typological than population thinking, I pay attention precisely to the way in which the first organism(s) belonging to a new (metaphysical) natural kind come into existence. That their emergence may not be equivalent to the notion of the origin of a new species from the biological (empirical) point of view need not be detrimental to my approach, once we remember that the hylomorphically grounded essentialist (and thus metaphysical) definition of species and the notion(s) of species used in the practice of biological (and thus scientific) taxonomy are related, although certainly not straightforwardly coextensive (as already stated in Section 2.4).

In other words, since the change at the population level is not possible without a covariant change at the level of individual organisms, the speciation at the level of population must be the function of a number of first organisms belonging to a new natural kind coming into existence and functioning in their natural habitat.

### 3.5. Levels of Similarity of Adjacent Species

Moreover, speaking about transformations of the biological material, we need to acknowledge that substantial changes accompanying the conception of offspring are of a special kind. They result in the coming into existence of new organisms whose SF is of the same type as that of their parental organisms. This is even more obvious in cases of asexual reproduction (e.g., by fission), yet unusual when compared with much more primitive chemical or biochemical substantial changes, which typically lead to the emergence of substances that are radically different from the reagents. Consequently, in the case of speciation, the last substantial change (conception) that crowns the entire process of an evolutionary transition is abnormal. The result is an organism whose SF belongs to a natural kind that differs from that of its parental organisms.

Understood in this way, speciation seems to violate the classical principle of similarity, which says that “[E]very agent produces its like” (SCG II, 21, no. 9). In other words, in the reproductive process, the agent cause of a given type gives origin to offspring that are similar to it. In response to this difficulty, it should be noted that according to the theory of biological evolution, the newborn first representative of the species  $S_2$  is in most aspects and dispositions similar to the organisms of the preceding species  $S_1$  from which it originates.

Nevertheless, the fact that the parents and their descendants do belong to different species requires some modifications in the interpretation of the classical principle in ques-

tion. We need to agree that the similarity between parents and their offspring should not be understood as an absolute, strict, and nonexceptional qualitative identity of their SFs. Rather, it can be defined in terms of a proportional proximity to the SF of the offspring, when compared with SFs of its parents. It is worth noting that Aquinas himself admits departure from the strict interpretation of the principle of similarity. In *ST I*, 104, 1, co. we read:

Sometimes, however, the effect has not this aptitude to receive the impression of its cause, in the same way as it exists in the agent: as may be seen clearly in all agents which do not produce an effect of the same species as themselves: thus the heavenly bodies cause the generation of inferior bodies which differ from them in species.<sup>19</sup>

Gloria Frost rightly notes that a certain level of dissimilitude between a cause and its effect can be the outcome of the fact that many effects are caused by the joined operation of a number of agents that have various active powers. She claims that, according to Aquinas, “In these cases, the effect will bear some similarity to each agent which produced it, and thus, it will resemble none of the individual agents perfectly” (Frost 2022, p. 101).

### 3.6. The Principle of Proportionate Causation and Evolution

The classical principle of similarity mentioned in the previous section—stating that “[E]very agent produces its like” (SCG II, 21, no. 9)—is, in fact, a particular variant of the more general principle of proportionate causation (PPC), which states that the effect cannot exceed in perfection its cause. The latter finds a variety of formulations in the writings of both Aristotle and Aquinas:

“[T]he begetter is of the same kind as the begotten” (*Meta.* VII, 8 [1033b 30]). “[W]hatever perfection exists in an effect must be found in the effective cause” (*ST I*, 4, 2, co.). “[N]o effect exceeds its cause” (*ST II-II*, 32, 4, obj. 1). “[N]othing acts beyond its species” (*Super II Sent.* 18, 2, 3). “[T]he order of causes necessarily corresponds to the order of effects, since effects are commensurate with their causes” (SCG II, 15, no. 4). “[E]very agent acts according as it is in act” (SCG II, 6, no. 4). “No effect can be more powerful than its agent cause” (*Super II Sent.* 18, 2, 3, obj. 3).<sup>20</sup>

One of the critical questions concerning the proposed metaphysical grounding of the evolutionary transitions is whether it violates the PPC, for what is postulated by the theory of evolution is a number of fundamental transitions leading to increased complexity and perfection of things.<sup>21</sup> These include transitions from abiotic to biotic; from replicating molecules to populations of molecules in protocells; from independent replicators to chromosomes; from RNA to DNA; from asexual clones to sexual populations; from single-celled forms to multicell and organic forms; from individual organisms to colonies; and from primates to humans (see Smith and Szathmari 2000, p. 17). It may seem that all these crucial changes go against the PPC.<sup>22</sup>

A number of possible responses have recently been offered and discussed, of which I will mention here but two.<sup>23</sup> The first departs from the question about the proper interpretation of the PPC, for when considered outside of the context of the medieval philosophy of nature and referred to the framework of contemporary science, this principle renders (ontologically) implausible not only causal dependencies and processes of speciation described in evolutionary biology but also a vast number, if not the majority of, substantial changes observed in nature and methodically investigated in physics, chemistry, biology, and other sciences. These are the changes where we observe new substance(s) coming into existence, which have new irreducible properties and perfections that are not observed in the substances they originated from (the reagents that entered the reaction, which effected a given substantial change).<sup>24</sup>

Hence, notes Brian Carl, the PPC needs to be interpreted in view of the complexity of levels contained in the causal hierarchy in Aquinas. This fact is often ignored by many

thinkers who pay attention primarily to proximate causes in their analysis of causal dependencies. For Thomas, all causal relationships in the subsolar reality take place within God's providence, where God is conceived as the first and principal cause, working in nature through secondary and instrumental causes. However, between the causation of God and of mundane creatures, Aquinas sees the mediating causality of angels and celestial spheres, especially the sun, which provides heat. Concerning the generation of animals, gametes (ovum and sperm—as we know today) are instrumental causes in relation to parental organisms, which are secondary (or instrumental) causes in relation to celestial spheres (in particular, the sun), which are secondary (or instrumental) causes in relation to angels, who are secondary (or instrumental) causes in relation to God.

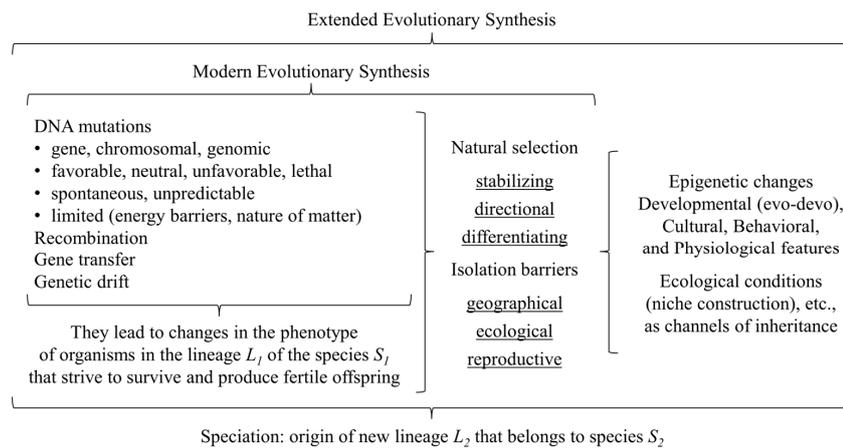
Consequently, Carl claims that for Aquinas, all changes (including all cases of generation and corruption) engage the entire hierarchy of causes, since—paradoxically—higher causes (separated substances) may not be able to bring about changes in mundane (physical) reality directly. He concludes by saying that

... the only general metaphysical principle that St. Thomas invokes in order to argue for the need for the instrumental contribution of a univocal generator is not the principle of proportionate causality, but instead the principle that a remote created universal cause needs the instrumental contribution of mediating instruments to produce more powerful effects. This principle seems reconcilable with evolution as well—although to articulate this reconciliation would require much further work. (Carl 2020, pp. 244–45)

The second possible response to the challenge of confronting PPC and evolution pays attention to the causal complexity of species transformations and rephrases the principle saying that whatever perfection is present in the effect must be present in its “total cause”. Indeed, one of the major faults of the debate on metaphysical aspects of evolutionary transitions and PPC as applied to them is a blatant oversimplification of their causal analysis. What is being taken into account is usually the last step (usually an act of fertilization or conception) of a causal process that is highly complex, multifaceted, and extended in both space and time. We might speak here about an evolutionary causal matrix (or causal polygeny), where relevant contributors to a given species transition are incredibly many. Their number might be, in fact, virtually impossible to estimate.<sup>25</sup>

In addition to genetic mutations, we may name a number of other accidental changes that are relevant to speciation, such as genetic recombination, gene transfer, genetic drift, and changes classified as epigenetic (i.e., permanent, nongenetic, yet heritable changes that affect DNA expression). Moreover, as already mentioned in the introduction, according to the extended evolutionary synthesis, we currently learn more about the synergy of evolution and development (evo–devo), as well as the importance of cultural, behavioral, physiological, and ecological inheritance (biological niche construction). Among additional factors, having causal influence on speciation, we find geographic, ecological, and reproductive barriers, as well as natural selection, which—strictly speaking—is not so much a cause but rather an explanation (a descriptive principle), turning our attention toward the fact of greater reproductive success of organisms that are better adapted to the environment in which the principle of struggle for existence applies. All these factors have an influence on living organisms which, by nature, seek to preserve life (maintain homeostasis) and produce offspring (reproduce). Furthermore, the organisms in question are closely linked in ancestral–descendant relations within populations in a given evolutionary lineage, which extends over extremely long periods of time, counted in hundreds of thousands or millions of years. See Figure 2.

Hence, the proportionate cause of a species transformation is not a single law or force but the concurrence of a highly complex set of causal agents, contributing to a speciation event or rather a multifaceted history of an evolutionary transition. The causal input of such an array of causes is stored and transmitted from generation to generation, up to the point in which a given organism is able to educe a new kind of SF from the potentiality of PM. This does not contradict the PPC.<sup>26</sup>



**Figure 2.** Speciation mechanisms.

### 3.7. Teleology and Chance in Evolution

One more philosophical controversy related to the theory of evolution concerns the role of teleology and chance in speciation. The debate on this topic has a long history, beginning from Darwin’s ambiguity concerning the notion of purpose, through the molecular revolution inspiring a strongly reductionist line of reasoning typical of neo–Darwinism, to the more recent renewed interest in and conversation about the role of goal–directedness in biological explanation. For the purpose of this article, I will limit myself to signaling the relevance of the classical Aristotelian–Thomistic notion of teleology and chance in the context of the theory of evolution.<sup>27</sup>

Aristotle defines final cause as “that for the sake of which” something is done, or a good that can be achieved and that is relevant to a given nature (entity).<sup>28</sup> It takes its alternative name, “teleology”, from the Greek *τέλος* (*telos*), which translates as “end” or “goal”. Although he invokes necessity as an explanation of the availability of suitable matter, Aristotle acknowledges the importance of the category of purpose as a function of nature to explain the fact that a given portion of matter acquires the particular shape and structure it does.<sup>29</sup> Aquinas notes that teleology may refer to both the immanent (intrinsic) and transeunt (extrinsic) agency of a given thing (see, e.g., *Q. de ver.* 14, 3). He speaks about a natural inclination, i.e., a natural impetus that each substance has for engaging in determinate actions that produce determinate goals: “In natural beings there is a desire for or an inclination toward some end or goal, to which the will of a rational nature corresponds; and for this reason a natural inclination is itself called an appetite” (*In Meta.* V, lect. 6 [§ 829]).

It is important to note that both Aristotle and Aquinas extend teleology (goal–directedness)—which many tend to associate with/limit to conscious human decisions—to other living and nonliving entities. Indeed, as notes Bostock, in *Meteo.* IV, 12 (389b 25–390a 21) “Aristotle does explicitly say that the elements, and the inorganic compounds that are formed from them, are ‘for the sake of something’, equating this with the view that they have a ‘function’ (*ἔργον* [*ergon*]) which in turn is a power (*δύναμις* [*dynamis*]) to act or be acted upon” (Bostock 2006, p. 71). Moreover, Aristotle and Aquinas help us understand that when predicated of inanimate and animate yet unconscious nature, teleology must not be thought of as a mysterious—quasi–efficient—cause, directing and organizing things according to a pre–established harmony.<sup>30</sup> Quite the contrary, they think it should be perceived as a natural tendency of things to realize (actualize) what is proper to their nature (e.g., a tree blossoming and bearing fruit)—a tendency that does not need to be known, reflected about, or intended by a conscious agent.<sup>31</sup> That is why Aristotle delineates in *Phys.* II, 8 (199b 26–27) that “it is absurd to suppose that purpose is not present because we do not observe the agent deliberating”.<sup>32</sup>

As a source of regularity and order in observed reality, teleology is often opposed to chance. However, the classical approach helps us realize that the relationship between

these two fundamental categories is more nuanced. With regard to chance, Aristotle considers it to be, first of all, an ontological aspect of reality and not merely an epistemological unexpectedness of certain occurrences due to the limitations of human understanding.<sup>33</sup> To explain the nature of chance, Aristotle refers to the distinction between *per se* (καθ' αὐτὸ αἴτιον, *kath' hauto aition*) and incidental (κατὰ συμβεβηκός, *kata symbēbēkos*), or *per accidens* causes. He sees *per se* causes as fundamental and relevant—in a given causal situation—efficient causes that are grounded in nature (φύσις, *physis*) or intellect (νοῦς, *nous*). As such, they should be related to the formal and final causality of a given agent or a set of agents. In other words, an efficient cause is acting *per se* when its activity is performed by an agent, in accord with the agent's SF, to produce its proper effect (see *Phys.* II, 7, [198a 23–26]). The character of the second *per accidens* (accidental) type of causes, on the other hand, can be explained in reference to Aristotle's metaphysical account of substance. Just as an accident (accidental formal feature) of an entity has no existence of its own but is rooted in its substantial formal features, an accidental cause must be related to a *per se* cause (see *Phys.* II, 3 [195a 26–34]; II, 5 [196b 24–29]).

An example taken from Aristotle's own writings might be in place here. Thinking about the origin of a statue, we may consider its sculptor to be its essential (*per se*) efficient cause. If the sculptor happens to be fair-skinned and have musical skills as well, we may be justified to claim that a musician or a fair-skinned man made a statue. Nevertheless, his musical talent and the fact that he is fair-skinned are only incidental (coincidental, *per accidens*) causes with respect to the *per se* causality of him being a sculptor.

In light of this distinction, Aristotle suggests classifying chance as an unusual incidental (*per accidens*) cause, which—although inherently unpredictable—nonetheless falls in the category of things that “happen for the sake of something” (since it refers and is related to such occurrences). Thus, chance occurrences are in a way posterior, since their manifestation and subsequent analysis require a reference to *per se* causes relevant to a given causal situation. Consequently, trying to specify its ultimate nature, Aristotle states that “chance is an incidental cause. But strictly it is not the cause—without qualification—of anything” (*Phys.* II, 5 [197 a 12–14]). And yet, since chance is distinguished as a unique type of occurrence that is not primary and yet is inherently related to nature (φύσις, *physis*) and intellect (νοῦς, *nous*), it needs to be defined in reference to *per se* formal and final causality rather than blind material necessity. This tells us that delineating it in stark opposition to these causes is an unjustified simplification.<sup>34</sup>

The suppositional character of the Aristotelian–Thomistic notion of teleology and the postulate of an intrinsic relation of chance to regularity and order can be applied to our description of evolutionary changes. I claim that although mutations are truly random (they occur by chance) and the finality of their causes is unrelated to the adaptiveness of the resulting biological trait, they have a *per accidens* character with respect to the *per se* causes of living beings that strive to survive and produce offspring. In other words, mutations are meaningful for the homeostasis and fitness of an organism in virtue of the *per accidens* relevance of their efficiency for the functioning and well-being of an organism, grounded in and defined by its *per se* causes. The acceptance of the plural notion of causality helps us understand that the chance character of mutations can be properly understood and seen as relevant to evolutionary transitions only in reference to a broader causal framework describing the nature and agency of entities involved in those changes. Consequently, it seems to me that Darwin would be utterly surprised by the famous utterance of Jacques Monod, saying that:

It necessarily follows that chance alone is at the source of every innovation, and of all creation in the biosphere. Pure chance, absolutely free but blind, at the very root of the stupendous edifice of evolution: this central concept of modern biology is no longer one among many other possible or even conceivable hypotheses. It is today the sole conceivable hypothesis, the only one that squares with observed and tested fact. And nothing warrants the supposition—or the

hope—that on this score our position is ever likely to be revised. (Monod 1970, p. 112)

In light of what has been said here about teleology and chance, it becomes apparent that evolution must not be attributed to blind chance, which would actually mean giving up the possibility of explaining reality.<sup>35</sup>

#### 4. Thomistic School of Theology and Evolution

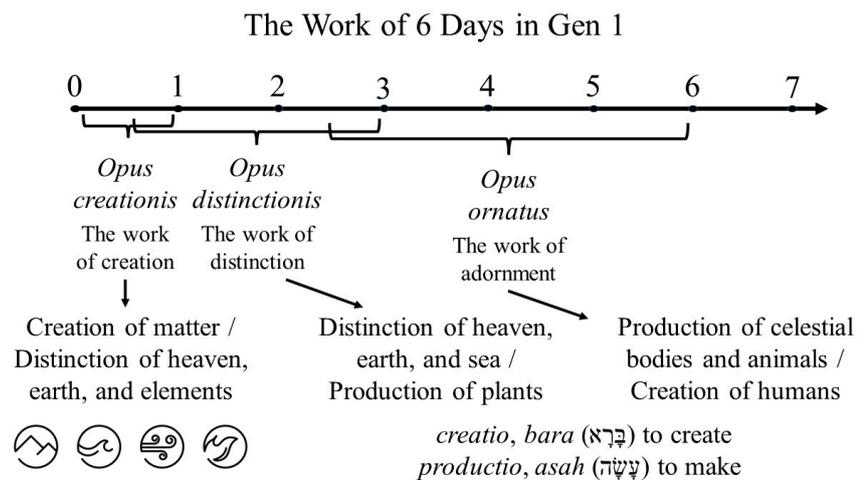
The constructive proposal of the Aristotelian–Thomistic metaphysics of evolutionary transitions—grounded in biological essentialism—developed in the preceding sections, raises an important question. Reflecting on the repercussions of the evolutionary theory in the theology of creation and in our understanding of divine action in the universe, the proponents of theistic evolution state that Christian theology is compatible with the modern scientific understanding of cosmological, geological, chemical, biochemical, and biological evolution.<sup>36</sup> However, a question needs to be asked as to whether the Thomistic school of theology is ready to side with theistic evolution and what its contribution to the main premises of this theological position might be. To answer these queries, we need to begin with a brief presentation of the classical Thomistic account of the creation dogma.

##### 4.1. Aquinas's Account of Creation

Following the approach of Aquinas, in which philosophical theology precedes an interpretation of the biblical account offered in the book of Genesis, we may say that the creative act of God—distinct from any movement and change (as they require some pre-existing material)—has two principal and intrinsically related aspects: (I) creation understood as active divine agency on the part of God and (II) creation understood as the passive reception of divine agency on the part of creatures. Concerning (I), Aquinas further distinguishes between (Ia) the primordial creative act, defined as bringing all beings into existence out of nothing (*ex nihilo*), without any preexisting matter, and (Ib) sustaining and preserving (upholding) all things both in the fact that they are (their existence—*esse*) and in what they are (their essence—*essentia*). As a consequence of (Ia) and (Ib), all contingent entities depend entirely on God—again, both in the fact that they are (their existence) and in what they are (their essence). This dependency explains the passive aspect of creation (II).<sup>37</sup>

Moving to Aquinas's Treatise on the Work of the Six Days (see *ST I*, 65–74), we should emphasize that Thomas understands creation *ex nihilo* as the coming into being out of nothing (i.e., not from a preceding being of any kind) of the most primitive types of contingent entities: the four elements (and possibly the fifth element—ether, from which celestial bodies are made). He thus sees it as an act that was instantaneous, rather than extended in time. We infer this based on Aquinas's differentiation between the work of creation (*opus creationis*) and those of distinction (*opus distinctionis*) and adornment (*opus ornatus*) in his analysis of the work of the six days in the first part of the *Summa theologiae*.<sup>38</sup>

The outcome of the work of creation (*opus creationis*) was the coming into existence of the most primitive matter (*materia secunda*), which was, in fact, inseparable from the first three stages of distinction (*opus distinctionis*), the second of which was the distinction “of the elements according to their forms”.<sup>39</sup> The outcome of the work of distinction (*opus distinctionis*) was the separation of land from the sea, accompanied by the preliminary stage of the work of adornment (*opus ornatus*), the production of plants.<sup>40</sup> The outcome of the work of adornment (*opus ornatus*) was the production of celestial bodies and animals and the creation of man.<sup>41</sup> See Figure 3.



**Figure 3.** Graphic depiction of the sequence of the work of the six days in the account of Genesis 1. Following the biblical account, Aquinas sees the first steps of the *opus distinctionis* as taking place on the first day (the day of *creatio ex nihilo*). This includes the introduction of the distinction between heaven and earth and the distinction between the elements, similar to the first steps of the *opus ornatus*, which take place on the third day. They include the production of plants (which in antiquity were often treated as inanimate due to their immobility).

4.2. Aquinas’s Use of Augustine’s Notion of *Rationes Seminales*

Following Aquinas’s distinction, we should acknowledge that the subsequent production (*productio*) of more complex contingent beings was, in a way, mediated through the most basic forms of material stuff—the origin of which was the outcome of the work/act of creation (*opus creationis*). In other words, more complex entities, in some respect, came “from” them.

Indeed, Aquinas realizes that even a literal interpretation of Genesis suggests that (1) it was earth that brought forth (gave origin to) plants, the green herbs, and fruit trees; (2) it was water that brought forth (gave origin to) an abundance of swimming creatures and birds (Aquinas suggests it despite the fact that Genesis does not say explicitly where they came from); (3) it was earth that brought forth (gave origin to) all kinds of living creatures, such as cattle, creeping things, and wild animals of all kinds. Hence, following Augustine’s concept of *rationes seminales*,<sup>42</sup> Aquinas states that plants and trees might have been produced “in their origin or causes”; that is, the earth “received ... the power to produce them”. They were subsequently brought into existence in “the work of propagation”.<sup>43</sup> Similarly with fishes and birds, which Augustine saw as produced by “the nature of waters on that [fifth] day potentially” (*ST I, 71, 1, corp.*), and animals, whose “production was potential” as well (*ST I, 72,1, corp.*).<sup>44</sup>

4.3. From Gradualism to Evolutionism

As mentioned above (Section 3.1, footnote 12), Augustine’s interpretation of the creation account in Genesis became an attractive point of reference in the advent of the debate concerning Darwin’s theory of evolution. It was in this context that an attempt was made to describe Augustine’s theory as “evolutionary”. However, it must be emphasized that his notion of the actualization of the limited and fixed number of the hidden “latent forms” (*rationes seminales*)—followed by Aquinas—introduces gradualism within a pre-established harmony of the universe rather than anticipating the modern evolutionary theory. However, in light of Aristotelian hylomorphism and his metaphysics of stability and change, Augustinian *rationes seminales* may be seen not so much as organisms virtually present in their dormant forms, hidden forces, or potencies (fixed and limited in number)—that are inherent to the most primitive matter created at the origin of the universe—but rather as a category depicting the two levels of metaphysically interpreted potentiality, also specified

in Section 3.1. I believe this allows for introducing the idea of evolutionary changes and transitions not only within the framework of the Aristotelian–Thomistic metaphysics but also in reference to Aquinas’s philosophical theology.

A reader familiar with Thomistic theology might object, saying that according to Aquinas, (1) the origin of the first exemplars of all higher forms of life, including human beings, required his direct divine intervention;<sup>45</sup> (2) the number of species in the universe is pretty much fixed (the counterexamples of new species emerging from putrefaction and crossbreeding are rare exceptions rather than proofs for an ongoing natural process of the production of new species);<sup>46</sup> and (3) *opus ornatus* is accomplished and current processes of generation and corruption do not give origin to new species—rather, they effect the emergence of new exemplars of already existing natural kinds.<sup>47</sup>

However, we should not ignore some other passages in Aquinas’s *corpus* where he states that (1) the universe, in the beginning, was perfect with respect to the causes present in it but not as regards all of their effects;<sup>48</sup> (2) the description of the way in which things emerged as an outcome of divine creation does not directly pertain to the substance of the faith;<sup>49</sup> (3) God can still make the universe better by introducing new species;<sup>50</sup> and (4) if new species, in fact, do emerge, they were in the potency of primordial matter that came into existence as an outcome of creation.<sup>51</sup>

I claim that in light of all that has been stated so far, it is possible to propose a consistent and relevant Thomistic version of theistic evolution, where God can be seen as working in nature through secondary and instrumental causes, bringing thus into existence new natural kinds of living (and nonliving) beings. While such an assumption might require introducing some adjustments to Aquinas’s theological system (I will specify them below, in Section 4.7), these are rather minor changes that do not contradict nor radically transform its most fundamental doctrinal aspects. Quite to the contrary, they go with it smoothly, proving once again its flexibility and openness to everchanging scientific knowledge about the universe we live in. The following three sections will highlight some crucial aspects of the proposed Thomistic version of theistic evolution.

#### 4.4. Does God Create through Evolution?

Once we agree that evolutionary transitions and the emergence of new biological species can be seen as one of the crucial aspects of divine agency, we face a question concerning the kind of divine action that is at work in those changes. The received opinion of the vast majority of contemporary proponents of theistic evolution—who strive to prove that the scientific notion of evolution does not contradict the theological belief in divine creation—is that divine action in and through evolutionary processes is creative. They commonly emphasize that *creatio divina* is not limited to the original bringing of the universe into existence out of nothing (*ex nihilo*). Rather, they see it as being extended in time. To make their case, they turn toward the category of continuous creation (*creatio continua*), which is perceived by many theologians as a modern expression of the classical doctrine of divine conservation (*conservatio*). Reinterpreting it in the context of the theory of evolution, they suggest that *creatio continua* should be seen as accommodating the idea of God’s bringing into existence new natural types of inanimate and animate entities in the course of the history of the universe.<sup>52</sup>

In addition, based on this model of relating evolution and creation, theistic evolutionists often conclude that through their causal efficacy in evolutionary processes, contingent agents participate in God’s creative activity. Moreover, according to some of them, the notion of God creating through the agency of secondary causes engaged in evolutionary transitions supports the kenotic strain of contemporary theology, which assumes that “God empowers and fulfills finite beings by negating Godself” (Peterson 2013, p. 453). In other words, “By creating the world out of love, God *kenotically refrains from the exercise of detailed predetermination* in order to give room for creaturely self–development” (Gregersen 2013, p. 257).

This approach to the relation between creation and evolution inspires a significant terminological shift proposed by Denis Lamoureux, who claims that the word arrangement in the term “theistic evolution” is rather ill-fated as it places “the process of evolution as the primary term, and makes the Creator (creation) secondary as merely a qualifying adjective”. He thus prefers to speak about “evolutionary creation” or “evolutionary creationism”—making “creation” the primary term and “evolutionary” a qualifying one. He states, “Evolutionary creation claims that the Father, Son, and Holy Spirit created the universe and life through an ordained, sustained, and design-reflecting evolutionary process” (Lamoureux 2009, pp. 28–30).

I believe that in light of what was said so far in this article, it becomes apparent that, from the Aristotelian–Thomistic perspective, the concept of “evolutionary creation” is rather problematic, if not altogether ill-conceived. The notion of the creative act of God as extended in time and including or taking place through natural and created agents’ contribution to evolutionary processes and transformations does not seem to agree with Aquinas’s definition of creation in terms of (I) and (II), delineated in Section 4.1. Still more controversial is the claim that God bestows on his creatures a power to co-create with him, i.e., that he shares with created entities his divine power to create. This suggestion contradicts the view of Aquinas who clearly states that “It is impossible for any creature to create, either by its own power or instrumentally—that is, ministerially”. For if “to create” means “to produce being absolutely, not as this or that being ... it is manifest that creation is the proper act of God alone” (*ST I*, 45, 5, co.). In the same treatise on creation in his *Summa theologiae*, answering the question comparing creation to the works of art—performed by creatures—Aquinas adds that “in the works of nature creation does not enter, but is presupposed to the work of nature” (*ST I*, 45, 8, co.; see also *ST I*, 45, 8, ad 1, ad 4).

Consequently, assuming that evolutionary processes and transformations do occur throughout the history of the created universe (and we have vast scientific evidence in support of the claim that they do), we should not consider them as an aspect of divine creation. This claim, paradoxically, diminishes the ultimate distinctiveness of the divine act of creation from all phenomena and all types of causal agency observed in the universe. Rather, we should see evolutionary processes as one of the integral parts of the divine governance of the created universe, directing it to its eschatological consummation and fulfillment. In other words, we can state that in the course of the complex matrix of the processes that effect particular cases of species transitions, God acts as the primary and principal cause of novelty, working through the secondary and instrumental agency of natural contingent beings. Consequently, what he shares with his creatures (if such language is appropriate at all) is not so much his divine infinite power to create but rather his power to providentially guide and direct the contingent reality to its final end, along the path that abounds in the astonishing beauty of new types of inanimate and animate creatures.

Accordingly, related to this critical evaluation of theistic evolution is a strong conviction that the apparent novelty of entities, their structural and dispositional properties, and the processes that they enter does not require a creative activity of God, understood in terms of (Ia) (Section 4.1), to occur. As such, these new forms of life emerge in already existing matter, in the course of continuous transformations, which bring the actualization of its potentiality—a potentiality which God himself endowed it with. Hence, I suggest we must leave behind the somewhat confusing concept of “continual creation” (*creatio continua*) and go back to the classical categories, namely, Aquinas’s distinction of the intrinsically interrelated (Ia) divine creation out of nothing (*creatio ex nihilo*) and (Ib) divine conservation (*conservatio*) of created beings.<sup>53</sup> Sustained by God in their *essentia* and *esse*, they should be seen as caught up in an incessant dynamics of processes of generation and corruption, which, in turn, effect the coming into existence of new entities. As such, they may belong to already existing natural kinds or give origin to new natural kinds of contingent beings. These entities naturally and necessarily depend on God for their existence and essence, which Aquinas grasps and expresses in the passive aspect of his definition of creation (II).

#### 4.5. Concurrence of Divine and Created Causes in Evolutionary Transitions

Having said that divine action in evolution is not creative but belongs to God's providential governance of the created universe on the path to its final perfection and beauty, we are still left with the question concerning the exact character of this particular aspect of God's agency. In other words, we may ask what exactly God does in an evolutionary transition and whether his causal power in speciation is entirely delegated to the secondary and instrumental causation of creatures.

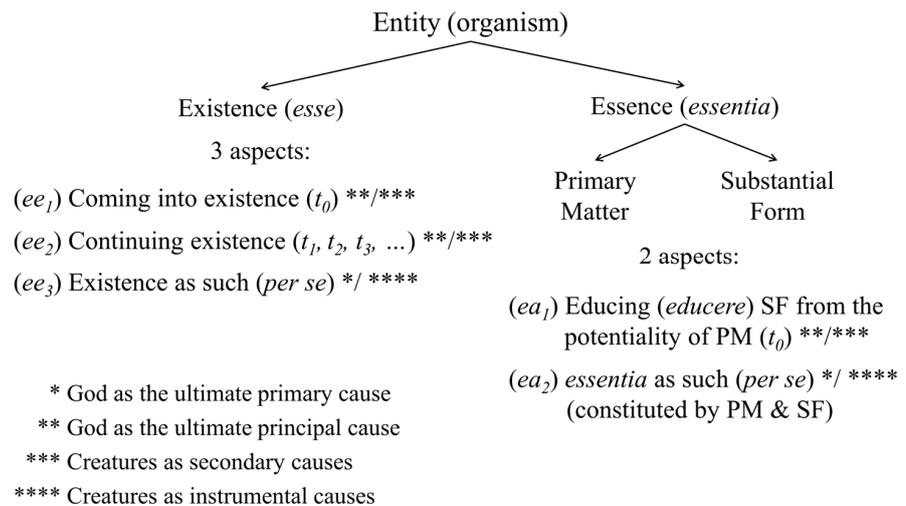
The distinction between the primary and principal causation of God and the secondary and instrumental agency of creatures is willingly applied by many theistic evolutionists to their theological explanation of cases of the origin of new species, in which parental organisms of species  $S_1$  bring into existence the first organisms that belong to the new species  $S_2$ . They claim that the parental organisms in question can be seen as acting—in some respect—both in accordance with and beyond their own causal dispositions, i.e., as both secondary and instrumental causes in the hands of God. However, neither non-Thomistic nor Thomistic proponents of theistic evolution seem to engage in a more detailed analysis of divine agency in the processes that lead to the emergence of new species. On the Thomistic side of the conversation, the modeling of divine action in evolution is usually limited to a careful presentation of Aquinas's understanding of creation and his aforementioned distinction between the primary (and principal) causation of God and the secondary (and instrumental) causation of his creatures, followed by a general application of these principles to evolutionary transformism and the emphasis on the fact that God works in nature both through *per se* causal agency of his creatures and the *per accidens* quasi-causality of chance (see, e.g., Luyten 1954, p. 30 [after Donceel 1965, pp. 301–2]; Maritain 1952, p. 38; Carroll 2006; Dodds 2012, pp. 205–28).

I suggest that one way to fill this lacuna can be grounded in Aquinas's distinction between existence (*esse*) and essence (*essentia*) applied to the processes of generation and corruption. Concerning *esse*, I propose to distinguish its three fundamental aspects: ( $ee_1$ ) coming into existence (at  $t_0$ ); ( $ee_2$ ) continuing existence in time ( $t_1, t_2, t_3, \dots$ ); and ( $ee_3$ ) the perfection of existence taken as such (*per se*). Concerning *essentia*, I propose to distinguish its two fundamental aspects: ( $ea_1$ ) educating (*educere*) SF from the potentiality of PM (at  $t_0$ ); and ( $ea_2$ ) *essentia* (constituted by PM and SF) taken as such (*per se*).<sup>54</sup> In addition, I suggest that we can assign particular dimensions/competences of divine and natural causal agents with respect to these aspects of *esse* and *essentia* in the following manner:

1. God is always (and in each case) the ultimate primary cause of ( $ee_3$ ) and ( $ea_2$ ) and the ultimate principal cause of ( $ee_1$ ) and ( $ee_2$ ), as well as of ( $ea_1$ ) of all created entities.
2. Creatures can act as secondary causes (dependent on the primary causation of God) of ( $ee_1$ ) and ( $ee_2$ ), as well as ( $ea_1$ )—with respect to contingent entities other than themselves.<sup>55</sup>
3. Creatures can also act as instrumental causes (dependent on the principal causation of God) of ( $ee_3$ ), as well as ( $ea_2$ )—with respect to contingent entities other than themselves.

The distinction between secondary and instrumental causes is based on the assumption that the former are capable of bringing about effects that match their natural ontological dispositions (though being dependent on the agency of a primary cause), while the latter bring about effects that go beyond their natural dispositions, on account of their capacities being augmented (elevated) by a principal cause (as an instrument in the hands of an artist).<sup>56</sup> See Figure 4.

I suggest that these distinctions allow us to specify further and assign particular types/aspects of causal agency to God and to creatures in natural changes, particularly in the generation of new offspring—including those cases in which it leads to the emergence of the first representative(s) of a new species. The proposed model is grounded within a more general framework distinguishing between the two related yet distinct orders of causation: the immanent and the transcendent.



**Figure 4.** Specification of divine and natural causal competences with respect to particular aspects of *esse* and *essentia*.

Concerning the scenario in which parental organisms give birth to a new exemplar of the species they themselves belong to, we may say that they are:

1. Proper causes of their offspring’s coming into being (in a most basic and pre-philosophical causal explanation).
2. Secondary causes of (*ea*<sub>1</sub>), i.e., the instantiation of their offspring’s essence (defined as the education of the appropriate SF from the potentiality of PM) and of its (*ee*<sub>1</sub>), i.e., coming into existence, as well as its (*ee*<sub>2</sub>), i.e., continuing in existence (permanence in time)—the latter by removing causes of corruption and engaging in nurturing their offspring, which is necessary for its survival and growth.
3. Instrumental causes of (*ea*<sub>2</sub>), i.e., their offspring’s essence (*essentia*) and (*ee*<sub>3</sub>), i.e., its existence (*esse*) taken as such (*per se*).

As secondary causes of (*ea*<sub>1</sub>), (*ee*<sub>1</sub>), and (*ee*<sub>2</sub>), the parental organisms depend on the primary causality of God, who is the origin and source of all efficient causality effecting the actualization of PM by the variety of SFs and the ultimate end of natural goal-directedness in creatures. As instrumental causes of (*ea*<sub>2</sub>) and (*ee*<sub>3</sub>), they depend on the principal causation of God, the Creator of PM and all SFs and the first and only source of *esse*. Note that while creaturely *esse* has its primary and direct source in God (being *de facto* a participation in divine *esse*), it is not equivalent to God’s *esse*. It is *esse* that comes from God and yet is not identical to a contingent creature’s essence (*essentia*) but proportionate to it. Hence, we must emphasize that it is predicated of creatures analogously (using both an analogy of attribution and of proper proportionality).

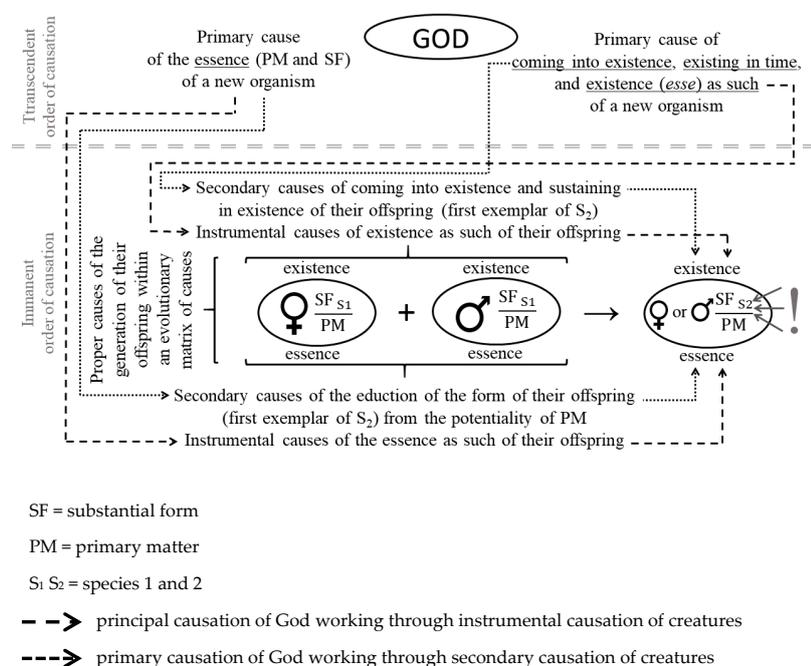
In other words, the same agency of parental organisms, which are rightly conceived as proper causes of their own offspring within the immanent order of causation, should be classified as secondary and instrumental causation from the point of view of the transcendent order of causation, in which God is the first, principal, and ultimate cause of both the essence (*essentia*) and existence (*esse*) of every contingent being.

If this reasoning is sound, then—as in the case of a regular begetting of an offspring that belongs to the same species—our causal description of the emergence of the first representative of the new species *S*<sub>2</sub> allows us to distinguish and specify:

1. The proper cause of its origin in the immanent order of causation (in a most basic and pre-philosophical causal explanation), i.e., the agency of the parental organisms belonging to the species *S*<sub>1</sub>, within the complex dynamic system of immanent causes, involved in the causally polygenic evolutionary change leading to the coming-to-be of the first exemplar of the species *S*<sub>2</sub>.

2. The secondary cause of ( $ea_1$ ), understood as the eduction of its proper SF from the potentiality of PM, i.e., the agency of the parental organisms, within the complex system of immanent causal factors, involved in the polygenic process of the instantiation of the first exemplar of the SF of the new species  $S_2$  in a given “portion” of a designated mater, which is its principle of individuation.
3. The instrumental cause of ( $ea_2$ ), i.e., its essence (*essentia*), taken as such, defined in terms of the agency of the parental organisms, within the complex system of immanent causes, which is accompanied by the instantiation of the first exemplar of the new species  $S_2$  (the actualization of PM by a new kind of SF of the species  $S_2$ ).
4. The secondary cause of its ( $ee_1$ ), i.e., coming into existence (*esse*), defined in terms of the agency of efficient causes (parental organisms acting within the evolutionary matrix of causes), which is accompanied or followed by the coming into existence (*esse*) of their offspring, which happens to be the first exemplar of the new species  $S_2$ . If parental organisms engage in nurturing their offspring, which is necessary for its survival and growth, they are also considered secondary causes of ( $ee_2$ ), i.e., their offspring’s continuing existence (permanence in time).
5. The instrumental cause of ( $ee_3$ ), i.e., its existence (*esse*), taken as such, defined in terms of the agency of parental organisms (within the evolutionary matrix of causes), which brings or is followed by an instantiation of the first exemplar of the new species  $S_2$ .

In other words, similar to the case of begetting offspring belonging to the same species, parental organisms of the species  $S_1$ , considered as parts of the dynamic polygenic causal matrix of an evolutionary transition, can be regarded as proper causes of the prototype organism of the new species  $S_2$  within the immanent order of causation. The same causal agency that brings to a conclusion the process of speciation in question has the nature of secondary and instrumental causation from the point of view of the transcendent order of causation, in which God himself is the first, principal, and ultimate cause of the essence and existence of every contingent being. See Figure 5.



**Figure 5.** Concurrence of divine and natural causes in an evolutionary transition.

It is worth noting that, according to the proposed model of the concurrence of divine and natural causes in evolutionary transitions, direct divine intervention is not needed for new natural kinds of plants and animals to emerge. However, the situation differs with respect to the origin of the human species.

#### 4.6. Theological Anthropogenesis and Evolution

The encounter of theological and biological views on anthropogenesis inspired the most emotional reactions to evolutionary theory and posed a considerable challenge to both biblical exegesis and theological anthropology. The history of the conversation between scientific and religious worldviews on the topic of hominization is thus long and complicated. However, what interests me the most—in the context of the material presented in this article—is the received view of human speciation in the age of evolution, expressed in the official statements of the Magisterium of the Catholic Church. Accepting its logic, I will offer a correction to its dualistic overtones, in light of the Aristotelian–Thomistic system of thought.

The received view in question assumes that God gave spiritual and immortal souls (created directly *ex nihilo*) to one or to a pair of animals whose bodies were properly prepared by evolution. It was first formulated in the nineteenth century and promoted, among others, by St. George Jackson Mivart, John Augustine Zahm, and Filippo De Filippi. The first one of them states:

Scripture ... says that “God made man from the dust of the earth, and breathed into his nostrils the breath of life”. This is a plain and direct statement that man’s body ... was evolved from preexisting material (symbolized by the term “dust of the earth”), and was therefore [formed] by the operation of secondary laws.

The soul of every individual man is ... created ... produced by a direct or supernatural act, and, of course, ... by such an act the soul of the first man was similarly created. (Mivart 1871, pp. 295, 300)

More recently, this view found support in official documents of the Magisterium of the Catholic Church (*Humani generis*, no. 36) and in the official address to the Papal Academy of Sciences by John Paul II (issued in 1985). However, the proponents of this opinion do not specify exactly whether the union of the human soul with the body occurred in the embryonic stage or after birth, which makes many think about the infusion of the human soul into an already existing human body.

In response to this opinion, and following Aristotle and Aquinas, I want to emphasize that there cannot be a human body without a human soul, nor a human body that can receive a human soul. Neither can a humanoid body receive a human soul, unless it is corrupted. In other words, no already informed (actualized) entity (secondary matter) can receive another SF (it can only receive AFs), unless it is corrupted. Hence, I suggest that the first human soul(s) was/were created *ex nihilo* at the moment of the conception of the first human being(s). It/they actualized PM, underlying gametes produced by male and female hominins at the moment of the substantial change accompanying fertilization. The designated PM in question was properly disposed to be actualized by the first human soul(s) within the complex evolutionary process that is vastly extended in space and time.

The first scholar who suggested a proper interpretation of evolutionary theory from the point of view of the Aristotelian–Thomistic school of philosophy and theology, along the line proposed here, was French Dominican Marie–Dalmace Leroy. In his 1891 book, he corrected the dualistic overtones of the proposal made by Mivart and Zahm, saying that “It is only after the infusion of the soul, and because of the infusion itself, that man is constituted a living being. Before infusing the spirit, there was nothing human, not even the body, inasmuch as human flesh cannot exist without the soul, which is its substantial form” (Leroy 1891, p. 261 [after Artigas et al. 2006, p. 59]).<sup>57</sup>

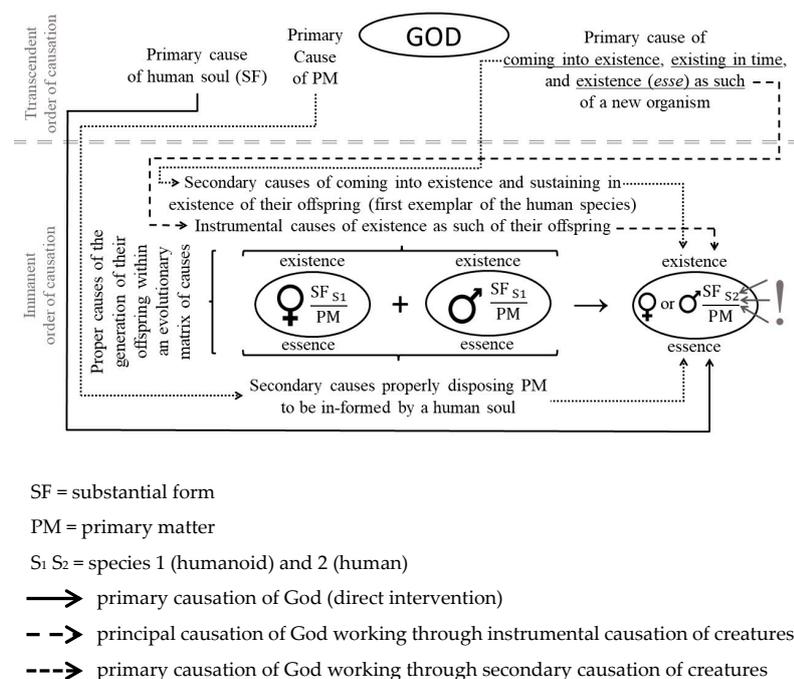
Consequently, based on the Aristotelian–Thomistic understanding of human nature and the model of the concurrence of divine and creaturely causal agency in evolutionary transitions offered in the preceding section, we can now try to adapt the same model to depict the evolutionary origin of the human species. Once again, we need to remember that for Aquinas, God creates a new human soul (SF proper for a human being) *ex nihilo* at the moment of conception (our coming into existence). Consequently, each human soul is not and cannot be educed from the potentiality of PM, as in the case of the SFs of all other

natural beings (both inanimate and animate). It is directly created by God. At the same time, it is correct to view parental organisms (together with other agents in an evolutionary matrix of causes) as properly disposing PM to receive it.

Accordingly, although parental organisms can be still regarded as secondary causes of the coming into existence (*esse*) as well as instrumental causes of the existence (*esse*) of the first human being(s), taken as such, when it comes to its/their essence (*essentia*), they can only be called secondary causes of the proper disposition of PM to be actualized by the first human soul(s), which is/are not educed from the potentiality of PM but is/are directly created by God *ex nihilo*. This applies to each subsequent begetting of a new human person. At the same time, it is worth noticing that the direct divine action of God in the creation of human souls is not miraculous. It belongs to the natural order of the universe he created, that human souls are not educed from the potentiality of PM but created by God *ex nihilo*.<sup>58</sup>

Moreover, as notes James Madden, the fact that the human soul(s) was (were) created *ex nihilo* does not introduce (or is an outcome of) an empirical gap. Quite the contrary, due to the proper disposition of PM, biological material in the hominins' ovum (ova) and sperm is ready to go through a substantial change that will give origin to the first exemplar(s) of the human species. In other words, if there is a gap, it is ontological, not empirical.<sup>59</sup>

Hence, the variation of my model of causation in the evolution of man will look as depicted in Figure 6.



**Figure 6.** Concurrence of divine and natural causes in the evolution of man.

#### 4.7. Thomistic Version of Theistic Evolution

Summing up my reflection, I would like to propose a list of ten fundamental postulates of the contemporary Thomistic version of theistic evolution (TVTE) presented in this article.<sup>60</sup> It includes the following propositions:

1. TVTE pays attention to natural science and accepts the biological notion of evolution. It carefully follows the research and critical debate concerning the mechanisms of speciation. It also actively engages in the analysis of philosophical aspects and interpretations of the past and current versions of evolutionary theory.
2. TVTE is grounded in Aristotle's and Aquinas's hylomorphism and ontology of living beings, emphasizing their unity, in reference to the principles of their stability and changeability (see Section 2.1). It also assumes and defends biological essentialism (see Section 2.2).

3. TVTE is also grounded in the metaphysical model of evolutionary transitions as delineated in Section 3, with a special emphasis on the categories of the disposition of matter, levels of potentiality, and the notion of matter understood as directed toward perfection. Another crucial aspect of the same model is its application of the notion of the interplay of teleology and chance offered in classical metaphysics (see Section 3.7). (This foundation safeguards TVTE from the pitfalls of materialist reductionism and causal monism.)
4. Theologically speaking, TVTE emphasizes, after Aquinas, that the initial act of creation is restricted to the *creatio ex nihilo* of the most basic physical matter of the elements and keeping the ever-transforming and changing universe in existence (*conservatio rerum*). Hence, it clearly distinguishes between creation and the processes of the emergence of new things from the already existing secondary matter of the universe.
5. TVTE interprets the continual and ongoing processes of micro- and macro-evolution as belonging to the work of adornment (*opus ornatus*), whose subsequent stages are not limited to the closed and past time interval but extend through the entire history of the universe.
6. TVTE acknowledges that the perfection of the universe can grow daily not only with regard to the number of individuals but also with regard to the number of species.
7. TVTE assumes that (with the exception of humans) SFs of the first exemplars of new species are educed from the potentiality of PM. It also states that the similarity between parents and their offspring (including offspring belonging to a new species) should not be understood as an absolute, strict, and nonexceptional qualitative identity of their SFs. Rather, it can be defined in terms of a proportional proximity to the SF of the offspring, when compared with the SFs of its parents (see Section 3.5).
8. TVTE holds that the origin of species occurs through “production” (*productio*) from pre-existing matter with ancestry in a process of universal common descent, in which God’s agency concurs with the secondary and instrumental causation of creatures. This proposal is grounded in the reinterpreted version of Augustine’s concept of *rationes seminales*, which Aquinas introduces in his theology of creation (see Sections 4.2–4.5).
9. TVTE does not require direct divine intervention in the origin of a new plant or animal species. The exception is the human species, where the first human soul(s) was/were created *ex nihilo* at the final step of the speciation process, and all subsequent human souls are created *ex nihilo* at the moment of the conception of each new human being. The first human soul(s) actualized PM properly disposed within evolutionary processes.
10. (TVTE remains open-minded in the debate on mono- *versus* polygenism.)<sup>61</sup>

It is worth noting that even if points (5–9) might be considered as going beyond the way Aquinas understood and explained creation, their introduction seems to be necessary, taking into account contemporary science, the current status of evolutionary biology in particular, and the most recent scientific and philosophical analysis of causation and causal relationships in nature. At the same time, they certainly do not contradict any of the core principles of Aristotelian–Thomistic philosophy and theology. Quite the contrary, the possibility of harmonizing them with the main objectives of classical thought proves the flexibility of the latter and its relevance within the context of contemporary science.<sup>62</sup>

## 5. Conclusions

The aim of this article was to present a concise version of the contemporary Aristotelian–Thomistic perspective on evolution and theistic evolution that I discuss at length in my recently published book (Tabaczek 2024). In my treatment of evolutionary theory, I do not aim to verify its validity or determine the adequacy of its extrapolation to other areas of scientific research. This remains the task of those who engage in the scientific endeavor. Rather, aware of the particular status of the theory of evolution at the current stage of the development of the science of biology, I strive to show that, if true,

evolution does not oppose or contradict the classical Aristotelian–Thomistic philosophical and theological view of reality.

Speaking of philosophy, I believe that my research shows that the reflection on the metaphysical and ontological aspects of biological evolution provides a new opportunity for the retrieval of some of the most fundamental categories of classical philosophy, including hylomorphic essentialism, the notion of act and potency, the disposition of matter, and the interplay of teleology (regularity) and chance in dynamic transformations of living beings. This proves that the longstanding legacy of the Aristotelian–Thomistic school of thought is not only coherent and consistent but also flexible and open to new data and current ways of understanding the universe, its structures, and its processes.<sup>63</sup>

Most importantly, the Aristotelian–Thomistic metaphysics applied in the context of biological evolution presents itself not as an aged doctrine that is limited to humble listening and adjusting of its principles to the new scientific theories, but, quite to the contrary, as a voice that has much to offer. In the complex debates on (1) the definition of species, (2) the character of natural selection, (3) the relevance and role of teleology, and (4) the role of chance in evolutionary processes, the classical philosophical tradition brings an essential contribution to the results achieved by science—a contribution that has considerable explanatory power, which must not be neglected.

With respect to (1), the contemporary Aristotelian–Thomistic school of thought supports the retrieval of and offers a metaphysical grounding for the typological/essentialist/individualistic aspect of the category of species, helping thus to overcome decades of the overemphasis on the populational thinking in biology and the extreme of a purely relational and historical approach to defining species (best expressed in biological and cladistic species concepts). Concerning (2), the same school of philosophy—in reference to its careful reflection on the ontology of the laws of nature—protects biologists and philosophers of biology from treating natural selection as a teleological agent cause. It reminds them that natural selection merely describes the phenomenon of differential survival and reproduction of individuals due to differences in phenotype.<sup>64</sup> At the same time, moving to (3), the Aristotelian–Thomistic tradition helps us realize that evolutionary theory presupposes teleology at the level of individual organisms that strive to survive (maintain homeostasis) and produce fertile offspring—i.e., in reference to fundamental tendencies characteristic of living beings (tendencies taken for granted by most evolutionary biologists) that are indispensable for any differentiation within evolutionary lineages.<sup>65</sup> Finally, addressing (4), the classical school of thought—paying attention to and metaphysically grounding the notion of the interplay of regularity/goal-directedness and chance/fortune in nature—helps us overcome the ideological and extreme view of the evolving reality as run by pure chance.

A similar point can be made in reference to Aquinas's theology, including his longstanding, carefully developed, and cautiously nuanced definition of creation and God's providential governance of the universe, as well as his understanding of divine action. These categories prove to serve as remarkably precise and useful conceptual tools, helpful in delineating the contemporary framework of theistic evolution. They enable us to answer the question of whether God creates through evolution and to build a constructive model of the concurrence of divine and natural causes in evolutionary transformations, including the origin of the human species.

At the same time, in the theological part of my work, I have pointed toward some necessary changes that need to be introduced in Aquinas's reasoning for it to be relevant with respect to evolutionary theory. I believe that this allows us to move beyond a certain dose of skepticism toward classical theology and appreciate the longstanding legacy of the Aristotelian–Thomistic tradition, which remains vigorous and ready to enter a vivid and fruitful conversation with contemporary philosophy and science.

Having said this, I acknowledge that both the theory of evolution and its philosophical and theological interpretations are subject to ongoing critical verification and actualization, which is a regular part of the progress of all academic disciplines and the theories and

hypotheses they offer. Concerning the theological side of the conversation, we might think about a number of further challenging questions that need to be addressed. They include:

1. The question concerning the amount of pain, suffering, and death in evolutionary processes.<sup>66</sup>
2. The question about mono- and polygenetic views of human speciation, with reference to the notion of original sin and its transmission.<sup>67</sup>
3. The question concerning the confrontation of the classical understanding of the original state of human nature (original justice/righteousness), including the notion of praeternatural gifts (especially impassibility and physical immortality), with the evolutionary view of the origin of the human species.<sup>68</sup>
4. The notion of the human species as the crown and pinnacle of biological evolution in confrontation with the notion of the continuing human evolution, trans- and posthumanism, and the possibility of an emergence of new (higher) intelligent species on Earth or somewhere else in the cosmos.<sup>69</sup>

These and other questions are the subject of ongoing interdisciplinary research engaging science, philosophy, and theology. It remains my hope that this article and my recently published book offer a useful contribution to this conversation.

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## Notes

- <sup>1</sup> Among more significant contributors we should mention Mortimer J. Adler, Benedict Ashley, Nicanor Pier Giorgio Austriaco, F. F. Centore, William E. Carroll, Michael Chaberek, John N. Deely, Charles DeKoninck, Joseph Donceel, Ryan Fainche, Réginald Garrigou-Lagrange, Étienne Gilson, James R. Hofmann, Édouard Hugon, Marie-Dalmace Leroy, Norbert Luyten, Jacques Maritain, Ernan McMullin, Désiré-Joseph Mercier, Antonio Moreno, Raymond J. Nogar, Fran O'Rourke, Edward T. Oakes, R. P. Phillips, Gerard M. Verschuuren, and William Wallace.
- <sup>2</sup> I am thinking here in particular about comments made by Ivan Colagè and Simon Maria Kopf, in their critical response to the book at the promotional event organized in December of 2023 at the Pontifical University of Saint Thomas Aquinas in Rome. I am also grateful for the critical remarks and suggestions shared by both anonymous reviewers of this article. They helped me clarify some of its fundamental assertions.
- <sup>3</sup> The nominalist position in the debate on biological species inspires the definition of units of speciation at the level of populations (less often at the level of individual organisms). In other words, what explains the abundance of living forms is genetic variation and the distribution of traits among organisms within populations. As David Oderberg notes (in reference to Margaret Morrison's reflection on the importance of the contribution of R. A. Fisher to the development of population genetics [[Morrison 2000](#), pp. 214–24]), "The idea is that individual organisms, and hence their putative essences, play no explanatory role in evolutionary theory. The aim of that theory is to explain biological diversity, but to do this all one needs is an account of the genetic variation in populations, each member of which is unique and not a representative of some essential type. This variation can be encapsulated by general statistical laws that do not refer to the causal powers of individual organisms, so one does not need 'specific knowledge of the individuals themselves' in order to understand evolutionary mechanisms". ([Oderberg 2007](#), p. 207).
- <sup>4</sup> "The species problem is one of the oldest controversies in natural history" ([O'Hara 1993](#), p. 231). It is "one of the thorniest issues in theoretical biology" ([Kitcher 2003](#), p. xii). What indicates the scale of the controversy is certainly the fact that we have around two dozen species concepts in the philosophy of biology and, as claims Ereshefsky, "at least seven well-accepted ones" ([Ereshefsky 1998](#), p. 103). See also ([Richards 2008](#), pp. 161–88) (he defines at least 16 species concepts).
- <sup>5</sup> Genetic dispositions-based essentialism was proposed by [Kitts and Kitts \(1979\)](#) and [Rieppel \(2010\)](#). Dispositional-based essentialism is favored by [Wallace \(2002\)](#) and [Austin \(2017\)](#). Related to it, a developmental programs-based version of biological essentialism was developed by [Austin \(2017\)](#) and [Boulter \(2012\)](#). The mixed approach, defining essences in reference to both genetic and/or phenetic properties and relational/historical aspects of organisms, was developed by [Devitt \(2023\)](#) and [Elder \(2008\)](#). Origin essentialism, introduced by Saul [Kripke \(1980\)](#), is advocated by Elliott [Sober \(2024\)](#), pp. 178–79). I discuss contemporary versions of essentialism in greater length in [Tabaczek \(2024\)](#), pp. 74–81).

- 6 Note that the reference to efficient causes in the causal description of an organism introduces a historical aspect to the hylomorphic variant/aspect of biological essentialism. Yet, as notes Oderberg, “It does not follow from the fact that a substance or species has a certain historical origin that its essence is to have that origin, even if it has its origin necessarily” (Oderberg 2007, p. 101).
- 7 On this interpretation of essentialism, variation, being a result of the action of “interfering forces”, takes an organism away from its “natural stage”, making it thus “the result of imperfect manifestations of the idea implicit in each species” (Mayr 1963, p. 11). Paul Griffiths says variation makes an organism belonging to an intrinsically defined species a “deviation” from an “ideal” (Griffiths 2001, pp. 78–79). Sober finds this view to contrast Darwin’s, for whom “[i]ndividual differences are not *the effects* of interfering forces confounding the expression of a prototype; rather they are *the causes* of events that are absolutely central to the history of evolution”. He adds that “the Natural State Model presupposes that there is some phenotype which is the natural one which is independent of a choice of environment” (Sober 1980, pp. 371, 374). Jody Hey brings this line of criticism to its logical conclusion and says: “that variation among organisms is the crucial stuff of changing life and of life’s progress” is thought to be “devastating to essentialism” (Hey 2001, p. 62).
- 8 An expert in Aristotle’s biology, James Lennox, says that “Aristotle’s essentialism is not typological, nor is it in any way ‘anti-evolutionary’. Whatever it is Darwin was up against, it was not Aristotelian essentialism” (Lennox 2001, p. 162). I claim that the typological approach remains plausible when understood in line of the definition of natural kinds provided in the main text (Section 2.1).
- 9 In Tabaczek (2024, pp. 57–91, 170–74) I offer an extended analysis of all major species concepts and distinguish between the categories of metaphysical and biological species, natural kinds, and biblical kinds.
- 10 Commenting on this topic in the *Metaphysics*, Aristotle states what follows: “Regarding material substance we must not forget that even if all things come from the same first cause or have the same things for their first causes, and if the same matter serves as starting–point for their generation, yet there is a matter proper [i.e., properly disposed] to each, e.g., for phlegm the sweet or the fat, and for bile the bitter, or something else; though perhaps these come from the same original matter” (*Meta.* VIII, 4 [1044a 15–20]). Aquinas, in turn, comments on this passage thus: “From the things which are said here then it is evident that there is one first matter for all generable and corruptible things, but different proper [i.e., properly disposed] matters for different things” (*In Meta.* VIII, lect. 4 [§ 1730]).
- 11 One could object that PM cannot be disposed as this would lead to it losing its metaphysical status of pure potentiality. Hence, what can be disposed is only secondary (physical) matter. Still, I claim that the fact that the scope of possible actualizations of PM—when informed by a given SF and AFs—is limited allows us to say (at least analogically) that it is disposed. Especially when we emphasize that it is not disposed as such (*per se*) but as informed (actualized) by the given SF and a particular set of AFs. Another possible response to this question was proposed by Simon Maria Kopf, who suggests that the “proximate” potentiality of prime matter is nothing other than the disposition of “designated matter”, which through the substance’s AFs is not only extended under determinate dimensions but might also be argued to have determinate dispositions, which can be changed through new AFs.
- 12 Such a notion of potency is, for example, characteristic of the thought of Augustine. In his mature commentary on Genesis, he implements the Stoic notion of *rationes seminales* (λόγοι σπερματικοί, “seed–principles”) and states that “[God] created all [creatures] together ... whose visible forms He produces through the ages, working even until now” (*De Gen. ad litt.* V, 20). He adds that “there is in nature some hidden force by which latent forms are brought into view” (*De Gen. ad litt.* VI, 16). While providing an important point of reference for the reflection on the philosophical and theological repercussions of the theory of evolution, Augustine’s notion of the actualization of the limited and fixed number of the hidden “latent forms” must be classified as introducing gradualism within a pre–established harmony of the universe rather than anticipating the modern evolutionary theory (the latter was suggested, among others, by St. George Jackson Mivart, John Augustine Zahm, and Henry de Dorlodot—see Tabaczek [2024, pp. 135–37]). To give justice to Augustine, we should acknowledge that apart from the category of *rationes seminales*, he introduces the notion of unformed matter (*materia informis*), which he sees as neither actualized matter nor nothingness: “Something midway between form and nothingness” (*quiddam inter formam et nihil*)” (*Conf.* XII, 6, 6). Important for the interpretation of the “formless void” in Genesis 1 as a non–temporal absolute potentiality at the initial founding of the world, *materia informis* becomes for Augustine a principle of mutability: “The mutability of mutable things itself gives them their potential to receive all those forms into which mutable things can be changed. And what is this mutability? ... I would call it ‘a nothing–something’ [*nihil aliquid*] or ‘an–is–that–is–not’ [*est non est*] if such expressions were allowed” (*Conf.* XII, 6, 6). However, while this description of *materia informis* might be seen as resembling Aristotle’s *materia prima*, we must confront it with a set of passages in which Augustine seems to suggest it is a kind of basic stuff (i.e., secondary matter). In his unfinished commentary on Genesis, he states *materia informis* is “a kind of mixed–up material [*materies erat confuse quaedam*] out of which the world ... would be fashioned, by the sorting out of its elements and the bestowal on them of shape and form”. (*De Gen. ad litt. imp. lib.* IV, 11). In *Conf.* XII, 7 we read it was created *ex nihilo* in two kinds: spiritual and bodily: “Two realities [*duo quaedam*], one near to yourself, the other bordering on nothingness”. Similar is his view shared in *De Gen. ad litt.*, where he also speculates about the third, spiritual kind of *materia informis*—one that gave origin to the first human soul(s). See (Nordlander 2019).
- 13 On another occasion, Aristotle presents us with a similar reflection concerning transitions between various forms of life: “[N]ature passes from lifeless objects to animals in such unbroken sequence, interposing between them beings which live and yet are not

animals, that scarcely any difference seems to exist between two neighbouring groups owing to their close proximity" (*De part. an.* IV, 5 [681a 12–15]).

14 See also *In De an.* II, lect. 7, (§ 315); *Q. de pot.* 5, 1, co. and ad 5; SCG III, 22, no. 7.

15 Consequently, it should be stated that Aquinas's belief in the "tendency" of properly disposed matter to be actualized (informed)—in a line of consecutive accidental and substantial changes—by various new types of AFs and SFs (including SFs of increasingly higher natural kinds) does not concern only his views on human embryology (see SCG III, 22, no. 7) but can be regarded as a generally binding principle in his metaphysical system.

16 Similar metaphysical analysis may be developed with reference to organisms reproducing asexually.

17 Some thinkers argue that biological essentialism is not sustainable as it requires clear, nonbridgeable boundaries between species, which—in turn—suggests evolution is saltational and not incremental. I present this argument and respond to it in [Tabaczek \(2024, pp. 84, 86–88\)](#).

18 My concept of the metaphysics of evolutionary transitions is inspired by the works of a number of Thomistic philosophers and theologians. Among them, I would like to mention in particular [Carroll \(2006\)](#), [Gilson \(1984\)](#), [Moreno \(1973\)](#), and [O'Rourke \(2004\)](#).

19 Following Aristotle, Aquinas was convinced that the energy of the sun was necessary for substantial changes to occur on Earth. In reference to the example of celestial bodies causing the generation of lower bodies, one can argue that for Aquinas, effects that do not resemble their causes are always ranked ontologically "lower" than their causes, while speciation, as defined above, entails the possibility of originating an organism that is ontologically "higher"; that is, one that has new and metaphysically "more perfect" dispositions in respect to its direct efficient cause. This issue will be addressed in the following section of this article.

20 See also *Q. de pot.* 3, 8, obj. 13; *ST* I–II, 112, 1; *Comp. theo.* 1, 93. At the advent of modernity, Descartes upheld this principle (often called a causal adequacy principle). In his "Third Meditation", he states that "there must be at least as much reality in the efficient and total cause as in the effect of that cause" ([Descartes 1984, p. 28](#)).

21 The notion of the increased complexity and perfection of things mentioned here is not conceived teleologically. Rather, it simply acknowledges the fact that evolution produces things that can be classified at various levels of structural complexity and are characterized by different sets of dispositional properties. Moreover, speaking about perfection, we should not forget about "a fundamental difference between the metaphysical order of various degrees of perfection of different 'essences,' and the biological order of different forms of life which is based on a historical and phenomenological analysis. Metaphysical categories of 'higher' and 'lower' should not be equated with biological concepts describing organisms as 'more complex' and 'better adapted.' In other words, 'more complex' and 'better adapted' do not presuppose a higher perfection of 'essence.' Insects, for instance, are certainly not the highest organisms in terms of the metaphysical perfection of their 'essence,' but they can be regarded as a culmination of an evolutionary line in terms of adaptation to their environmental niche. That is why, when biology speaks of different species, it does not mean to speak of different 'essences,' as it is not interested in levels of ontological perfection" ([Tabaczek 2014, p. 60](#)).

22 Michael Chaberek claims that an evolutionary framework is incompatible with the thought of Aristotle and Aquinas. In his argumentation, he points to the principles that "no being can convey more act than it possesses", that "no effect can exceed the power of its cause", and that "the perfection of the cause cannot be lesser than the perfection of the effect" as incompatible with the evolutionary emergence of novel genera of living things. See [Chaberek \(2017, p. 48\)](#) and [Chaberek \(2019, p. 56\)](#).

23 The relevance of the first strategy described here (important for the proper understanding of the medieval formulation and interpretation(s) of PPC) might be limited to a certain form of Thomism. The second strategy is relevant in the context of the contemporary philosophical debate on the causal aspects of evolutionary transitions. Apart from the two strategies delineated in the main text, we may list other approaches to this problem, based on (1) a metaphysical differentiation of types of perfection; (2) the virtual and eminent presence of perfections; and (3) the conservation of the overall perfection of the universe. I discuss them in [Tabaczek \(2024, pp. 42–55\)](#). Another meaningful response to the challenge of PPC and evolution was suggested by Simon Maria Kopf, in reference to the notion of God's governing primary causation in, with, and through secondary causation executing his providence. If God's involvement in the agency of secondary causes includes creation, conservation, application, and instrumental causation, a divine application and especially an instrumental use of creaturely powers may explain an increase in the actuality or perfection of the first exemplar(s) of a given new species. I believe this suggestion goes hand in hand with my analysis of yet another possible response to the problem of PPC and evolution offered by Feser, i.e., the eminent presence of higher perfections in causes (see [Feser 2014, p. 155](#)): "The idea goes back to the medieval concept of a passive obediential capacity (*potentia obedientialis*) whereby the nature of a given cause can be 'elevated' such that it is capable to give what by nature it does not have. ... Hence, the 'elevation' of such agents is caused by the supernatural concursus of the First Cause, which enables them to bring about effects of an entirely higher order than those within the ambit of their natural powers" ([Tabaczek 2023a, pp. 51–52](#)).

24 Paying attention to the same problem of the popular interpretation of the PPC, Peter Coffey states: "The mediaeval scholastics embodied this truth in the formula: *Nemo dat quod non habet*—a formula which we must not interpret in the more restricted and literal sense of the words giving and having, lest we be met with the obvious objection that it is by no means necessary for a boy to have a black eye himself in order to give one to his neighbour!" ([Coffey 1970, p. 60](#)).

- 25 The idea of causal polygeny of events was introduced in the analytic philosophy of biology by John Dupré (1993, pp. 123–24), who, in turn, takes it from genetics, which acknowledges that many genes typically contribute to the production of one trait. Following Dupré, George Molnar (2003, p. 195) notes not only that events are polygenic, but also that causal powers, conversely, are pleiotropic and flexible and can make a contribution to many different effects.
- 26 This view was previously articulated by Luyten (1951), Ashley (1972), and Elders (1984). Interestingly, it finds grounding in Aquinas who, following Avicenna, distinguishes four types of efficient causes, including preparing and perfecting causes (see *In Meta.* V, lect. 2 [§ 766–69]; *In Phys.* II, lect. 5 [§ 766–69]). I claim that the former—preparing matter for form (*In Meta.* V, lect. 2 [§ 767])—can be extended to numerous causal agents contributing to the same complex evolutionary transition, while the latter—causing the ultimate perfection of a thing (*In Meta.* V, lect. 2 [§ 766])—might be referred to the cause that brings about (directly) the final step of an evolutionary transformation. See also Frost (2022, pp. 192–98). Both Ivan Colagè and Simon Maria Kopf suggest that the contribution of various factors emphasized in the extended evolutionary synthesis requires a closer examination on my side. I find their comment justified and will take it into account in my further reflection on the topic of evolution.
- 27 My extended analysis of teleology and chance in evolution can be found in Tabaczek (2024, pp. 92–126). There I address a number of important issues, including (1) an observation made by Aristotle in *Physics* and commented on by Aquinas in *In Phys.*, which might be interpreted as a preliminary formulation of the principle of natural selection; (2) a recent argument in the philosophy of biology portraying Darwin as reinventing (Aristotelian) teleology; (3) the debate on teleology among the founding fathers of the twentieth-century evolutionary synthesis; (4) the current status of teleology in philosophy of biology, and (5) the question of whether natural selection should be understood as teleological.
- 28 See *Phys.* II, 3 (194b 29–195a 2) and *Meta.* V, lect. 2 (1013a 29–1013b 2). See also *Phys.* II, 7 (198a 18–20); *Meta.* I, 2 (983a 30–32).
- 29 See, for instance, *De part. an.* III, 2 (663b 12–14); IV, 5 (679a 25–30); *De gen. an.* II, 4 (739b 27–31); III, 4 (755a 17–30).
- 30 Aristotle is careful to note that the final cause is not acting *sensu stricto*: “The active power is a ‘cause’ in the sense of that from which the process originates: but the end, for the sake of which it takes place, is not ‘active’. (That is why health is not ‘active,’ except metaphorically.) For when the agent is there, the patient becomes something: but when ‘states’ [ἕξεων, *hexeōn*, dispositions] are there, the patient no longer becomes but already is—and ‘forms’ [εἶδη, *eidē*] (i.e., ‘ends’) [καὶ τὰ τέλη, *kai ta telē*] are a kind of ‘state’ [ἕξεις, *hexeis*]” (*De gen. et corr.* I, 7 [342b 14–18]).
- 31 In response to the objection that the end—existing upon the completion of the agent’s action—cannot be its cause, Aquinas says that “Although the end be last in the order of execution, yet it is first in the order of the agent’s intention. And it is this way that it is a cause” (*ST I-II*, 1, 1, ad 1). Concerning natural causes that do not have cognition, Aquinas thinks their “intention” is expressed in their natural inclinations: “to intend ... is nothing else than to have a natural inclination to something” (*De prin. nat.* 19).
- 32 Aquinas has something similar to say in *De prin. nat.* 19: “we should notice that, although every agent, both natural and voluntary, intends an end, still it does not follow that every agent knows the end or deliberates about the end. To know the end is necessary in those whose actions are not determined, but which may act for opposed ends as, for example, voluntary agents. Therefore it is necessary that these know the end by which they determine their actions. But in natural agents the actions are determined, hence it is not necessary to choose those things which are for the end”. See also Bostock (2006, pp. 48–78), Gotthelf (1976), and Guthrie (1981, pp. 114–18).
- 33 Aquinas’s teaching on final causation follows—for the most part—the position of Aristotle. See *In Meta.* V, lect. 2 (§ 775); V, 3 (§ 781–82); *In Phys.* V, lect. 11 (§ 246); *De prin. nat.* 19, 34–36.
- 34 “No incidental cause can be prior to a cause *per se*. Spontaneity and chance, therefore, are posterior to intelligence and nature. Hence, however true it may be that the heavens are due to spontaneity, it will still be true that intelligence and nature will be prior causes of this all and of many things in it besides” (*Phys.* II, 6 [198a 8–13]).
- 35 In his *On the Origin of Species*, we find Darwin saying: “Mere chance, as we may call it, might cause one variety to differ in some character from its parents, and the offspring of this variety again to differ from its parent in the very same character and in a greater degree; but this alone would never account for so habitual and large an amount of difference as that between varieties of the same species and species of the same genus” (Darwin 1859, p. 111). I think this shows that Darwin was aware of the fact that ontologically real chance events that produce minor variations remain in synergy with the regularity and teleological character of life cycles and the transmission of features between generations. This allows for the accumulation of accidental changes that may lead, in extended periods of time, to speciation.
- 36 I treat this statement as a working definition of theistic evolution. It is commonly known that the theory of evolution was and still is perceived by many as challenging the more literal interpretation of the Bible and the creation story found in Genesis. The more than 160 years that have passed since the publication of Darwin’s book *On the Origin of Species* (1859) abound in both supportive theological interpretations as well as fierce theologically motivated refutations of his theory. Peters and Hewlett (2003) offer a helpful map of various theological responses to evolutionary theory. Another overview can be found in Fowler and Kuebler (2007). A list of important works related to (1) the historical account of the debate on evolution, (2) a general introduction to the encounter of theology and evolutionary biology, and (3) the debate on the theory of Intelligent Design, can be found in Tabaczek (2024, p. 12n25).

- 37 See *ST I*, 45, 1–3. Each of the points listed here can be unpacked and further analyzed. I offer such an analysis in [Tabaczek \(2024, pp. 142–47\)](#). My use of the qualification “contingent” in this context refers to the fact that all things created are transient and not necessary. It does not reflect Aquinas’s other use of contingency in the sense of a given thing being not fully determined in its nature to one end.
- 38 See Aquinas’s introduction to *ST I*, q. 65. Kretzmann notes that this distinction, present also in *Super II Sent.* 13, 1, 1; 14, 1, 5; 15, 1, 1; 15, 2, 2 and 17, 2, 2, is not fully developed in *SCG II*, 39–45, where *opus distinctionis* covers also *opus ornatus*: “[F]urnishing [*opus ornatus*] is never even mentioned in *SCG II* or, for that matter, anywhere else in *SCG*. So, if ‘distinguishing’ in II.39–45 designates Aquinas’s explanation of the origin of all species ... then in *SCG* ‘distinguishing’ covers also what is carefully separated off as the work of furnishing not only in *ST*, written after *SCG*, but also in Aquinas’s earlier *Commentary on the Sentences*” ([Kretzmann 1998](#), p. 186).
- 39 And even if only earth and water are named, adds Thomas, the author of *Gen 1:2* had in mind air and fire as well. The reason he does not mention them is that “the corporeal nature of these would not be so evident as that of earth and water, to the ignorant people” to whom he spoke (see *ST I*, 66, 1, ad 3 and reply to sc 2 of obj. 3).
- 40 We must remember that in antiquity, many thought plants were not living organisms because they do not move and allocate themselves. Hence, the production of plants in the account of Genesis preceded the actual *opus ornatus*.
- 41 Aquinas’s distinction between *creatio* and *productio* seems to correspond with the distinction between the Hebrew “to create” (*bara* [בָּרָא]) and “to make” (*asah* [עָשָׂה]). It is important to acknowledge that Aquinas is not always consistent in his use of these terms. See [Tabaczek \(2024, pp. 189–90\)](#).
- 42 Although Aquinas uses the term *rationes seminales* explicitly on numerous occasions in his commentary on the *Sentences*, in other parts of *ST*, in *De veritate*, *De potentia*, and *De malo*, and in some biblical commentaries, he paradoxically does not use it in his analysis of the works of the six days (*ST I*, qq. 65–74). At the same time, however, he does refer in these questions directly to the authority of Augustine and his concept of all types of creatures existing in *statu potentiae* in the earth (the primitive elements) and unfolding at the proper time, contrasting his view with the one held by “other holy writers”.
- 43 *ST I*, 69, 2, corp.: “In these first days God created all things in their origin or causes, and from this work He subsequently rested. Yet afterwards, by governing His creatures, in the work of propagation, ‘He worketh until now’. Now the production of plants from out the earth is a work of propagation, and therefore they were not produced in act on the third day, but in their causes only”.
- 44 See also *Q. de pot.* 4, 2, ad 28: “Before the plants were produced causally, nothing was produced, but they were produced together with the heaven and the earth. In like manner the fishes, birds and animals were produced in those six days causally and not actually”.
- 45 “[T]he first members of the species were immediately created by God, such as the first man, the first lion, and so forth” (*Super II Sent.*, 1, 1, 4, co.). See also *ST I*, 65, 4, co.
- 46 “In its beginning the universe was perfect with regard to its species (*quantum ad species*)” (*Q. de pot.* 4, 2, ad 22).
- 47 “To the perfection of the universe there can be added something daily with regard to the number of individuals, not, however, with regard to the number of species”. (*ST I*, 118, 3, ad 2).
- 48 “The universe in its beginning was perfect (...) as regards nature’s causes from which afterwards other things could be propagated, but not as regards all their effects” (*Q. de pot.* 3, 10, ad 2). See also *Q. de pot.* 4, 1, co., *Q. de pot.* 5, 5, ad 13.
- 49 “[W]ith respect to the beginning of the world something pertains to the substance of faith, namely that the world began to be by creation, and all the saints agree in this. But how and in what order this was done pertains to faith only incidentally insofar as it is treated in scripture, the truth of which the saints save in the different explanations they offer” (*Super II Sent.* 12, 1, 2, co.). See also *Q. de pot.* 5, 1, co.
- 50 “[T]he universe can be made better, either through the addition of many parts, that is to say, so that many other species would be created, and that many degrees of goodness that can exist would be complete, since the distance between the highest creature and God is still infinite; and thus God could have made [in this way] the universe better and can still do it” (*Super I Sent.* 44, 1, 2, co.). See also *ST I*, 25, 6, ad 3.
- 51 “Species, also, that are new, if any such appear, existed beforehand in various active powers ... [i.e., they] existed previously in their causes, in the works of the six days” (*ST I*, 73, 1, ad 3).
- 52 The view delineated here is shared by a substantial group of theologians coming from different traditions and denominations. It includes the contributors to the 2009 edited volume of the Pontifical Academy of Sciences concerning cosmic and biological evolution, John Paul II, Benedict XVI, Pope Francis, Christoph Schönborn, Denis Alexander, Philip Clayton, Arthur Peacocke, Philip Hefner, Paul Davies, and Robert John Russell. Interestingly, the same view—although not without qualifications—is expressed by some Thomistic philosophers and theologians, including Benedict Ashley, Joseph Donceel, and Nicanor Austriaco. A more detailed presentation of the “creationist” strain of theistic evolution can be found in [Tabaczek \(2024, pp. 180–87\)](#).
- 53 Even if he emphasizes that “The preservation of things by God is a continuation of that action whereby He gives existence” (*ST I*, 104, 1, ad 4), Aquinas never uses the term “continual creation” (*creatio continua*), which gained much popularity in a more recent philosophy of religion and creation theology. Fabien [Revol \(2020\)](#) traces its origin back to one of the metaphysical meditations

of Francisco Suarez written in 1597, in which he (wrongly) attributes it to Aquinas saying “That is why S. Thomas claims that conservation is, as it were, a continual creation” (*Et ideo saepe dicit divus Thomas, conservacionem esse quasi continuatam creationem*) (Suarez 1861, D. 21, 2, 4 [791]).

- 54 The phrase “as such” (*per se*) is thought of, in this context, as a way of a more static and synchronic description of the metaphysical categories of *esse* and *essentia*. It is contrasted with the complementary dynamic and diachronic side of these metaphysical categories, expressed in terms such as “coming into existence (into being)”, “existence in time”, and “educing (eduction of) SF from the potentiality of PM”.
- 55 Having said that divine *conservatio* of created things belongs to/is an intrinsic aspect of divine *creatio*, creaturely secondary causation with respect to (*ee*<sub>2</sub>) should be defined in terms of providing conditions for the flourishing, i.e., a proper actualization of dispositions proper to a given natural kind to which the entity/the organism in question belongs.
- 56 See SCG III, 70, no. 8 and ST I, 45, 5, co. Ignacio Silva (2022, pp. 98–102) analyzes Aquinas’s further distinction of the four ways of being the cause of action of something else, introduced in *Q. de pot.* 3, 7, co.
- 57 This view finds support in *In De an.* II, lect. 1 (§ 225–226) and SCG II, 72, no. 3. More recently, an anti-dualistic concern with respect to the received notion of anthropogenesis was expressed by Ratzinger: “Can we divide up man in this way between theologians and scientists—the soul for the former, the body for the latter?” (Ratzinger 2011, p. 135).
- 58 This finds confirmation in Aquinas’s general conviction that creation is not miraculous simply because—being *ex nihilo*—it does not include or presuppose any pre-existing substance or order of nature. Unlike creation, miracles do presuppose and pertain to the order of nature. In other words, they are special ways in which God brings about changes in the created order. As Aquinas notes in ST I, 105, 7, ad 1: “Creation, and the justification of the unrighteous, though done by God alone, are not, properly speaking, miracles, because they are not of a nature to proceed from any other cause; so they do not occur outside the order of nature, since they do not belong to that order”.
- 59 “[W]hen I assert that the human soul has not evolved, I do not claim that there is some empirical gap that we expect to find in natural history” (Madden 2013, p. 273).
- 60 This is an updated version of the list offered in Tabaczek (2024, pp. 167–68).
- 61 This topic is not discussed in the present article. I analyze it in Tabaczek (2024, pp. 244–77).
- 62 My position is inspired by Kretzmann, who states: “Aquinas, of course, had no inkling of any scientific evidence that might prompt an attempt to provide a non-literal interpretation of the biblical account. But the very wording of the first chapter of Genesis, and his idea of the level of sophistication in the audience for whom it was originally intended, led him to join Augustine in taking a remarkably enlightened view of the way to read the story of the six days—a view that would, I think, have equipped Augustine and Aquinas to appreciate judiciously, rather than denounce, scientific accounts of evolution” (Kretzmann 1998, p. 190).
- 63 It is important to notice that the suggested return to the classical categories of hylomorphism, essentialism, and formal and final causation subscribes to a wider revival of Aristotelianism observed in most recent analytic philosophy, particularly in analytic metaphysics. The dynamic aspects of Aristotle’s view of reality—framed within his notion of intertwined categories of potentiality and actuality—are rediscovered in the contemporary metaphysics of dispositions and their manifestations, which also offer an important (dispositional) view of causation that both challenges and contributes to the number of post-Humean notions of causation discussed in analytic metaphysics (see my critical introduction to dispositionalism and dispositional view of causation in Tabaczek 2019a, chp. 5.6, pp. 181–245). Moreover, the recognition of dispositions as “pointing” or being “directed” toward their characteristic manifestations brings back the notion of teleology. Hence, the proponents of dispositionalism talk about “physical” and “natural intentionality”, characteristic of inanimate objects as well as nonsentient, sentient, and conscious forms of living organisms. Finally, an important and heated debate is ongoing with regard to various contemporary analytic notions of hylomorphism. This definitely proves the renewed interest in this crucial conceptual tool of Aristotle, which further translates into the contemporary retrieval of essentialism and the debate over natural kinds (see Tabaczek 2019a, pp. 216–41 and Tabaczek Forthcoming).
- 64 I discuss this issue in greater detail in Tabaczek (2024, pp. 118–23). Leaving aside a complex question concerning the status of general laws in biology (as compared with those formulated in physics and chemistry), my view builds on an important contribution coming from William Stoeger who states: “Although the laws of nature reveal and describe fundamental patterns of behavior and regularities in the world, we cannot consider them the source of those regularities, much less attribute them the physical necessity these regularities seem to manifest. Nor can we ascribe to them an existence independent of the reality whose behavior they describe. Instead I claim that they are imperfect abstract descriptions of physical phenomena, not prescriptions dictating or enforcing behavior. Thus, a Platonic interpretation of these laws is unjustified” (Stoeger 1993, p. 208). Consequently, we must admit that the law (principle) of natural selection reveals and describes the regularity of a greater reproduction success of organisms that are better fitted in their environment. Yet, it does not causally make them to be such or reach reproduction success. It is thus—contrary to what was suggested by Francisco Ayala (see my critical evaluation of his position in Tabaczek 2024, pp. 111–14)—not teleological.
- 65 Alvaro Moreno and Matteo Mossio note that “[E]volutionary mechanisms operate because they are embodied in the complex organization of organisms. Thus, if we look for the roots of the impressive capacity of life to proliferate, to create an enormous

variety of forms, to adapt to completely different environments, and particularly, to increase its complexity, we shall focus on individual living entities, namely on organisms, because evolution as an explanatory mechanism actually presupposes the existence of organisms” (Moreno and Mossio 2015, pp. xxi–xxii). Earlier on, in 1979, Francisco J. Varela argued that “evolutionary thought, through its emphasis on diversity, reproduction, and the species in order to explain the dynamics of change, has obscured the necessity of looking at the autonomous nature of living units for the understanding of biological phenomenology” (Varela 1979, p. 5).

- <sup>66</sup> A meaningful attempt at a Thomistic response to this aspect of the theodicy question can be found in a number of articles and a monograph authored by Keltz (2020). Beyond the Thomistic circle, this question was addressed by many, including Southgate (2008) and Sollereeder (2019).
- <sup>67</sup> As already mentioned, I discuss this debate at length in Tabaczek (2024, pp. 244–77). The conversation on this topic is open and requires further analysis and conceptual work.
- <sup>68</sup> A balanced yet critical evaluation of the traditional approach represented by Karl Rahner (1961a, 1961b) and Piet Schoonenberg (1965, pp. 181–85), has more recently found a response on the side of Roszak (2020) and Vanzini (2023), who strive to defend the classical notion of *praeternaturalia* in the age of science. Again, the topic requires further analysis and study.
- <sup>69</sup> An attempt at a Catholic/Thomistic response to some of these questions can be found in George (2005), Green (2015), and Tabaczek (2023b). Beyond the Thomistic circle, see Gouw et al. (2022), Peters et al. (2018), and Davison (2023).

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