

# What Do God and Creatures Really Do in an Evolutionary Change?

## Causal Analysis of Biological Transformism from the Thomistic Perspective

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This is the final draft of an article published in the 2019 summer issue of ACPQ:

<https://www.pdcnet.org/collection-anonymous/browse?fp=acpq&fq=acpq%2FVolume%2F8907%7C93%2F8997%7CIssue%3A%203%2F>

### Abstract:

Many enthusiasts of theistic evolution willingly accept Aquinas' distinction between primary and secondary causes, to describe theologically "the mechanics" of evolutionary transformism. However, their description of the character of secondary causes in relation to God's creative action oftentimes lacks precision. To some extent, the situation within the Thomistic camp is similar when it comes to specifying the exact nature of secondary and instrumental causes at work in evolution. Is it right to ascribe all causation in evolution to creatures – acting as secondary and instrumental causes? Is there any space for a more direct divine action in evolutionary transitions? The article offers a new model of explaining the complexity of the causal nexus in the origin of new biological species, including the human species, analyzed in reference to both the immanent and transcendent orders of causation. Formulated within the framework of Aristotelian-Thomistic philosophy and theology, it should be helpful for all those who refer to secondary causation of creatures in theological reflection on evolution.

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Key words:

Aquinas, Aristotle, Divine action, Evolution, Essence and existence, Hylomorphism, Instrumental causes, Principle of proportionate causation, Secondary causes

Throughout all our efforts, in every dramatic struggle between old and new views, we recognize the eternal longing for understanding: the ever-firm belief in the harmony of our world, continuously strengthened by increasing obstacles to comprehension.

Albert Einstein and L. Infeld, *The Evolution of Physics*

Many theologians who support the position of theistic evolution willingly accept Aquinas's distinction between primary and secondary causes, to describe theologically "the mechanics" of evolutionary transformism. Their description of the character of secondary causes in relation to God's creative action, however, oftentimes lacks precision. It is not entirely clear how they understand secondary causation of creatures and how they relate it to God's action in evolutionary changes. Moreover, their tendency to marry divine concurrence, defined in terms of the distinction between primary and secondary causes, with the particular version of the free-will defense argument—which entails God's free decision to limit his divine power to allow for creaturely self-determination (including human free will)—seems to be self-contradictory.

The situation within the Thomistic camp is similar, to some extent, when it comes to specifying the exact nature of secondary and instrumental causes at work in evolution. Important questions arise whether it is right to ascribe all causation in evolution to creatures—acting as secondary and instrumental causes—and whether there is any space for a more direct divine action in evolutionary transitions. This article offers a new model of explaining the complexity of the causal nexus in the origin of new biological species, analyzed in reference to both the immanent and transcendent orders of causation. Formulated within the framework of Aristotelian-Thomistic philosophy and theology, it should prove helpful for all those who refer to the secondary causation of creatures in theological reflection on evolution.

The article consists in ten sections. The first two describe references and understanding of secondary and instrumental causation in theistic evolution outside and within Thomistic theological circles. The following three sections offer an elementary introduction to the principles of Aristotelian ontology and metaphysics, presentation of the already proposed model of metaphysics of evolutionary transformism, and a reflection on Aquinas's discovery of *esse* and its influence on his definition of *creatio ex nihilo* and of what we tend to call nowadays *creatio continua*.

The intermediate section that precedes the main argument of the article explains the principles of our interpretation of Aquinas's theology in the context of the debate on the possibility of creation through biological evolution. The next two sections present our new constructive model of concurrence of divine and natural causes in evolutionary transformations. The second to last section addresses the difficult question concerning the unity of the nexus of causes engaged in an evolutionary change. The article closes with a short reflection on the theological advantages and consequences of the proposed model of divine and creaturely causation in evolution.

## I. Secondary Causation in Theistic Evolution Outside of Thomistic Circles

Theistic evolution, defined as the position striving to reconcile Christian faith with evolutionary biology, is in fact a collection of views ranging from those that reluctantly consent to the truth of evolutionary theory on the grounds of its scientific credibility, to those that embrace with great enthusiasm both developmental and evolutionary worldviews. Hence, the variety of theologians who may be classified as proponents of theistic evolution goes from more conservative or even fundamentalist thinkers such as Benjamin B. Warfield (1851-1921) to radically progressive adherents of transformism such as Pierre Teilhard de Chardin (1881-1955) for whom the concept of evolutionary advance become a foundation for his comprehensive epistemology, metaphysics and spirituality. Between these two extreme positions, Ted Peters and Marty Hewlett list a number of thinkers whose ideas gradually descend or ascend (depending on the opinion of their reader) from one end of the spectrum to the other. They mention: a cell biologist Kenneth Miller, a biochemist and theologian Arthur Peacocke (1924-2006), systematic theologians Denis Edwards and John Haught, physicist and theologian Robert John Russell, and systematic theologian Philip Hefner.<sup>2</sup>

The analysis of convergences and divergences between these theologians concerning deep time, natural selection and teleology, common descent, divine action, and theodicy shows that the majority of them value the concept of secondary causation.<sup>3</sup> They seem to find attractive the idea

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<sup>2</sup> See Ted Peters and Martin Hewlett, *Evolution from Creation to New Creation: Conflict, Conversation, and Convergence* (Nashville: Abingdon Press, 2003), chapter 6, 115-57.

<sup>3</sup> The idea of primary/secondary causation is not so important for de Chardin who sees divine action as uniformitarian, yet not in a deistic sense (God initially selects the laws that are operative through cosmic and evolutionary history and withdraws from any further individual interventions) but rather as an ongoing pantheistic divine guidance of evolution, internal to nature as it is internal to divine life. See Pierre Teilhard de Chardin, *The Phenomenon of Man* (New York: Harper, 1959). Philip Hefner seems to side with de Chardin on this issue. See Philip J. Hefner, *The Human Factor: Evolution, Culture, and Religion* (Minneapolis: Fortress Press, 1993). The position of Kenneth Miller on divine action is close to deism (even if he strives to avoid it). He does not point toward anything God could do within the natural world, which seems to make him

of God as primary cause working through the secondary causation of his creatures, as it enables them to assert the autonomy of both nature and God, working on separate yet connected planes of reality. A closer analysis of their use of the distinction between primary and secondary causation, however, reveals a lack of precision in defining it. Warfield uses it primarily to explain the simultaneously divine and human origin of the Holy Scripture and only secondarily as a base for his theological incorporation of evolutionary theory.<sup>4</sup> Others seem to compromise the concept of primary/secondary causation by joining it to the particular version of the free-will defense argument, which entails God's free decision to limit his divine power to permit creaturely self-determination, including human free will.<sup>5</sup> This tendency may be clearly seen in the position of Peacocke. While he does speak about God making "things make themselves" and the interplay of order and chance as secondary causes working in nature, Peacocke writes extensively about God's self-limitation in his omnipotence and omniscience as a condition for the coming into existence of free self-conscious human beings and finds a new level of God's presence in creation expressed in his sharing the world's sufferings.<sup>6</sup> The idea of self-limitation of God—a fellow sufferer who thus, affected by the world, shares in the very life of his creatures—is even more transparent in the versions of theistic evolution offered by Denis Edwards and John Haught. They both perceive God as engaged in self-restraint and self-removal, *i.e.*, creating through letting-be.<sup>7</sup>

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responsible only for its existence. See Kenneth R. Miller, *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution* (New York: Cliff Street Books, 1999).

<sup>4</sup> See Benjamin Breckinridge Warfield, *Evolution, Scripture, and Science: Selected Writings*, ed. Mark A. Noll and David N. Livingstone (Grand Rapids: Baker Books, 2000), 56-57.

<sup>5</sup> The free-will defense is a logical argument developed by Alvin Plantinga in response to the challenge formulated by John Leslie Mackie, who claimed that the key attributes of the God of Christian theism (his omniscience, omnipotence, and omnibenevolence) are logically incompatible with the existence of evil (see Alvin Plantinga, *God, Freedom, and Evil* [Grand Rapids, MI: Eerdmans, 1977], chapter 4; John Leslie Mackie, "Evil and Omnipotence," *Mind* 64 [1955], 200-212). Plantinga's original argument emphasized the moral value of human free will as a justified reason for God's permitting the existence of evil. The same argument from the defense of human free will (accompanied by the more general concept of creaturely self-determination), was later used to argue in favor of divine self-limitation in creation of the universe.

<sup>6</sup> See Arthur Robert Peacocke, *Theology for a Scientific Age: Being and Becoming—Natural, Divine, and Human* (Minneapolis: Fortress Press, 1993), 99-134.

<sup>7</sup> See Denis Edwards, *The God of Evolution: A Trinitarian Theology* (New York: Paulist Press, 1999); and John F. Haught, *God After Darwin: A Theology of Evolution* (Boulder, CO: Westview Press, 2000). Any logically-coherent theory that includes the claim that God limits his own power uses the term "God" in a sense quite different from that of Aquinas, for whom God is, of necessity, omnipotent. This will become more apparent in the latter sections of this article. The use of the term "God" in Peacocke, Edwards, and Haught, seems to be nearer to the one proposed by Hegel or Whitehead than to Aquinas's. See Mariusz Tabaczek, "Hegel and Whitehead: In Search for Sources of Contemporary Versions of Panentheism in the Science–Theology Dialogue," *Theology and Science* 11 (2013): 143–61.

Peters and Hewlett note that free-will defenders seem to contradict their own choice of applying the distinction between primary and secondary causation in their versions of theistic evolution. In fact, they “tacitly and perhaps unintentionally reject secondary causation, presuming rather that divine power and creaturely freedom belong on the same plane. ... The fallacy presupposes a fixed pie of power. According to the fixed pie image, if God gets a big slice then creation gets a proportionately smaller slice. If God would be all-powerful, then creation would be totally powerless.”<sup>8</sup> This criticism rightly shows that many contemporary theologians, who strive to reconcile faith with the scientific view of the universe, tend to speak about divine action in the world in univocal terms, locating it on the same ontological level as the causation of contingent creatures.

Robert John Russell tries to avoid this difficulty. In doing so, however, he seems to be getting close to the other extreme of the spectrum. Acknowledging the importance of secondary causation of creatures, he speaks about the direct divine action on the quantum level as the origin of evolutionary changes. He claims that this type of divine action is objective and non-interventionist (NIODA = non-interventionist objective divine action), since—according to the Copenhagen interpretation of quantum mechanics—we cannot expect natural causes to operate in these events, as they are ontologically indeterminate. Nevertheless, Russell’s version of theistic evolution may still be in danger of univocally predicating causation of God and creatures, since he suggests that God withdraws his causal activity with the advent of consciousness and human free will. This might suggest he needs to “make a space” for specifically human action.<sup>9</sup>

## II. Secondary Causation in Theistic Evolution Within Thomistic Circles

Within the Thomistic theological camp the situation looks different. Proponents of theistic evolution from among Thomists carefully avoid the mistake of the univocal predication of God’s and creatures’ causal activity. On the one hand, they do side with Aquinas’s assertion that “God’s immediate provision over everything does not exclude the action of secondary causes; which are the executors of His order.”<sup>10</sup> Since God as the Creator has gifted every creature with its proper

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<sup>8</sup> Peters and Hewlett, *Evolution*, 130-31, 143.

<sup>9</sup> See Robert J. Russell, *Cosmology from Alpha to Omega: The Creative Mutual Interaction of Theology and Science* (Minneapolis: Fortress Press, 2008), chapters 5-6, 151-225.

<sup>10</sup> *ST I*, q. 22, a. 3, ad 2. See also *ST I*, q. 19, a. 6, ad 3; q. 19, a. 8, co.; q. 23, a. 5, co.; q. 105, a. 5, ad 2; I-II, q. 10, a. 4, ad 2; Etienne Gilson, *The Christian Philosophy of St. Thomas Aquinas* (New York: Random House, 1956),

causality, according to its nature, his influence cannot interfere with this causality, but must rather be its source. On the other hand, they emphasize that, while we can say that a particular natural effect comes to be through the combined agencies of God and the natural agent, we must remember

that the same effect is not attributed to a natural cause and to divine power in such a way that it is partly done by God, and partly by the natural agent; rather, it is wholly done by both, according to a different way, just as the same effect is wholly attributed to the instrument and also wholly to the principal agent.<sup>11</sup>

Thus, Thomistic advocates of theistic evolution acknowledge that, metaphysically speaking, the divine action of a transcendent God does not belong to the same order of causation as that of his creatures. Even if “all created things, so far as they are beings, are like God as the first and universal principle of all being”<sup>12</sup> immanently present in their operations, the causation of the Creator infinitely transcends causation of all contingent creatures. The influence of the first cause is therefore not only more intense, so that we can assert with Aquinas that “God is more especially the cause of every action than are the secondary agent causes.”<sup>13</sup> We must also realize that God’s agency belongs, in its essence, to an entirely different ontological and metaphysical order of causation. Consequently, Thomistic evolutionists do not see any need of introducing divine self-limitation or the self-restriction of God’s attributes of omnipotence and omniscience, to explain the indeterministic character of some occurrences in nature, and the phenomenon of human free will.

Moreover, Thomistic theology offers one more important distinction concerning causal efficiency that might be helpful in explaining the position of theistic evolution. The passage from Aquinas’s *Summa contra gentiles* quoted above, in which he attributes causal effects observed in nature to the agency of both God and creatures, introduces a further distinction in the realm of secondary causes. Some of them act according to their natural dispositions, while others produce effects beyond their capacities. Aquinas classifies the latter as instrumental causes and emphasizes their dependence on principal causes for their operation (*e.g.*, an ax in the hand of a lumberjack). In other words, instrumental causes can be classified as a special kind of secondary causes, since every cause that acts under the influence of another is a secondary cause. At the same time, a cause

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176, 182-84; Rudi A. te Velde, *Participation and Substantiality in Thomas Aquinas* (Leiden, New York, Köln: E.J. Brill, 1995), 170-75.

<sup>11</sup> SCG III, 70, no. 8. “[J]ust as it is not unfitting for one action to be produced by an agent and its power, so it is not inappropriate for the same effect to be produced by a lower agent and God: by both immediately, though in different ways” (SCG III, 70, no. 5).

<sup>12</sup> ST I, q. 4, a. 3, co.

<sup>13</sup> SCG III, 67, no. 5. See also ST I, q. 21, a. 4, co.; q. 36, a. 3, ad 4; Q. *de ver.* q. 5, a. 9, ad 10; Q. *de pot.* q. 3, a. 7, co.

that produces an effect exceeding its natural capacity should be regarded as an “instrumental secondary cause (*causa secunda instrumentalis*)” (*ST I*, q. 45, a. 5, co.).

The distinction between secondary and instrumental causes may be applied to the theological explanation of cases of the origin of new species, in which parental organisms of species  $S_1$  give an origin to the first organism belonging to the new species  $S_2$ , acting thus—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, Thomistic proponents of theistic evolution oftentimes do not seem to engage in more detailed analysis of divine action in the coming to be of new species. Their argumentation seems to be limited to a very careful presentation of Aquinas’s understanding of creation and his distinction between primary causation of God and secondary (and instrumental) causation of his creatures, followed by a general reference of these principles to evolutionary transformism. N. Luyten, for instance, commenting on causality in evolution, states:

We know of enough cases where we meet a complex intertwined causality, and where a double efficiency does not simply stand beside each other, but works in a subordinated relationship. The classic doctrine of instrumentality has sufficiently studied the nature of such a causal subordination. Hence it is conceivable that, in the evolutionary process too, we must admit such a coordination of factors, in which a transcendent factor would cooperate not simply from without but from within with the evolutionary factors at work in the animal series. This means that the transcendent factor must at the same time be immanent so as to fuse innerly, as it were, with the purely immanent causality of the antecedent.<sup>14</sup>

A little bit more specific is the explanation provided by Jacques Maritain who, commenting on the passage from one ontological species to the next higher one, refers to the transcendent influence of the first cause, whose

existence-giving influx ..., passing through created beings and using them as instrumental causes, was able—and is still able—to heighten the vital energies which proceed from the form in the organism it animates, so as to produce within matter, I mean within the germ-cells, dispositions beyond the limits of that organism’s specificity. As a result, at the moment of generation a new substantial form, specifically “greater” or more elevated in being, would be educed from the potentiality of matter thus more perfectly disposed.<sup>15</sup>

Explanations offered by other Thomists—although generally correct and fitting within the orthodoxy of Aquinas’s system of philosophy and theology (with some necessary revisions of its basic principles)—are sometimes even more general when it comes to a precise explanation of the exact nature of causal agency of God and creatures in an evolutionary change. They do address

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<sup>14</sup> N. Luyten, “Evolutionisme En Wijsbegeerte,” *Tijdschrift Voor Philosophie* 1 (1954), 30, after Joseph Donceel, “Causality and Evolution,” *New Scholasticism* 39 (1965), 301-302.

<sup>15</sup> Jacques Maritain, *The Range of Reason* (New York: Scribner, 1952), 38.

numerous questions concerning philosophies of evolution, randomness and order, design, species, intrinsic teleology, or creation and divine providence in evolutionary changes in general and in evolution of man in particular.<sup>16</sup> They also provide, as we will see, a possible metaphysical “mechanism” of transformism. At the same time, however, they do not seem to clarify enough what exactly God does in an evolutionary transition and whether his causal power is entirely delegated to the secondary and instrumental causation of creatures. Such is the weakness of the otherwise quite thorough and informative works of Raymond J. Nogar or William Carroll on the theological aspects of evolution.<sup>17</sup>

The purpose of this article is to fill this lacuna by developing a model explaining the relation and concurrence of divine action and the causality of creatures in evolutionary changes. To make this model understandable and accessible to our reader, we need to begin with a brief introduction to the principles of Aristotelian ontology and metaphysics, followed by the already proposed explanation of metaphysics of evolutionary transformism and a reflection on Aquinas’s discovery of *esse* and its influence on his definition of creation.

### III. Aristotelian Hylomorphism and the Metaphysics of Change

The departure point of our analysis is the ancient metaphysics of Aristotle, whose thought—transmitted by Arabic thinkers—had been rediscovered in the Middle Ages, in the cradle of the Western Academia in Paris. It was Aristotle—whom Aquinas would simply call *the Philosopher* with the capital “P”—who introduced the theory of hylomorphism, *i.e.*, the most fundamental metaphysical composition of all material entities of matter and form. When we say “matter and form” (ὕλη and μορφή), however, we must realize—especially in the context of the contemporary

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<sup>16</sup> See for example: Travis Dumsday, “Is There Still Hope for a Scholastic Ontology of Biological Species?,” *The Thomist* 76 (2012), 371-95; Jacques Maritain, *Untrammelled Approaches* (Notre Dame, IN: University of Notre Dame Press, 1997), chapter VI: On the Philosophy of Nature (I) – Toward a Thomist Idea of Evolution, 85-131; Antonio Moreno, “Finality and Intelligibility in Biological Evolution,” *The Thomist* 54 (1990), 1-31; Ernan Mc Mullin, “Evolution and Special Creation,” *Zygon* 28 (1993), 299-335; Raymond J. Nogar, “From the Fact of Evolution to the Philosophy of Evolutionism,” *The Thomist* 24 (1961), 463-501.

<sup>17</sup> See Raymond J. Nogar, *The Wisdom of Evolution* (New York: Doubleday, 1963). William E. Carroll, “At the Mercy of Chance? Evolution and the Catholic Tradition,” *Revue Des Questions Scientifiques* 177 (2006): 179-204; William E. Carroll, *Creation, Evolution, and Thomas Aquinas*, <https://www3.nd.edu/~afreddos/courses/43150/carroll3.htm> (retrieved on February 22, 2018); William E. Carroll, “Creation in the Age of Modern Science,” *Tópicos* 42 (2012): 107-24. See also Nicanor Pier Giorgio Austriaco, “How Does God Create Through Evolution?” in Nicanor Pier Giorgio Austriaco *et al.*, *Thomistic Evolution: A Catholic Approach to Understanding Evolution in the Light of Faith* (Tacoma, WA: Cluny Media, 2016), 192-200.

neo-hylomorphism in analytic metaphysics—that these are not physical matter and geometrical shape that Aristotle has in mind (at least not in the very core of his definition of hylomorphism).<sup>18</sup>

While introducing his theory of four causes Aristotle does list the first two of them as: material and formal.<sup>19</sup> What is crucial concerning his philosophical understanding of matter, though, is its irreducibility to basic chunks of physical stuff (elementary particles) out of which things are made. Although one may find it difficult to grasp in the oft-cited quotations from *Physics* and *Metaphysics*, for Aristotle matter is the most basic metaphysical principle of potentiality, *i.e.*, primary matter (πρώτη ὕλη), underlying nature (ὑποκείμενη φύσις), or primary substratum (πρῶτον ὑποκείμενον), that persists through all changes that a given substance can be exposed to. As something that constitutes the very possibility of being a substance, it should be distinguished from secondary (proximate) matter, which is perceptible to our senses and quantifiable.<sup>20</sup> Understood this way, primary matter is real and exists, even if not with its own independent act of existence, but with the existence of a substance. Moreover, as pure being-in-potency, primary matter underlies each and every substance, remaining a principle of continuity in the process in which one substance ( $S_1$ ) becomes another substance ( $S_2$ ). Thus, in the occurrence of the change of substance  $S_1$  to substance  $S_2$ , we are not dealing with either a mere reorganization of elementary

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<sup>18</sup> For critical presentation and evaluation of contemporary neo-hylomorphic positions see Mariusz Tabaczek, *Emergence. Toward a New Metaphysics and Philosophy of Science* (South Bend, IN: University of Notre Dame Press, 2019), chapter 6.

<sup>19</sup> “In one sense, then, (1) that out of which a thing comes to be and which persists, is called ‘cause’, e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species. In another sense (2) the form or the archetype, *i.e.* the statement of the essence, and its genera, are called ‘causes’ (e.g. of the octave the relation of 2:1, and generally number), and the parts in the definition” (*Phys.* II, 3 [194b 24-28]).

“‘Cause’ means (1) that from which, as immanent material, a thing comes into being, e.g. the bronze is the cause of the statue and the silver of the saucer, and so are the classes which include these. (2) The form or pattern, *i.e.* the definition of the essence, and the classes which include this (e.g. the ratio 2:1 and number in general are causes of the octave), and the parts included in the definition” (*Meta.* V, 2 [1013a 24-29]).

<sup>20</sup> This becomes clear in the following passages from *Physics* and *Metaphysics*: “The underlying nature (ὑποκείμενη φύσις) is an object of scientific knowledge, by an analogy. For as the bronze is to the statue, the wood to the bed, or the matter and the formless before receiving form to any thing which has form, so is the underlying nature to substance, *i.e.* the ‘this’ or existent” (*Phys.* I, 7 [191a 8-12]). “The matter comes to be and ceases to be in one sense, while in another it does not. As that which contains the privation, it ceases to be in its own nature, for what ceases to be—the privation—is contained within it. But as potentiality it does not cease to be in its own nature, but is necessarily outside the sphere of becoming and ceasing to be. (...) For my definition of matter is just this—the primary substratum (πρῶτον ὑποκείμενον) of each thing, from which it comes to be without qualification, and which persists in the result” (*Phys.* I, 9 [192a 25-33]). “By matter I mean that which in itself is neither a particular thing nor of a certain quantity nor assigned to any other of the categories by which being is determined ... the ultimate substratum is of itself neither a particular thing nor of a particular quantity nor otherwise positively characterized; nor yet is it the negations of these, for negations also will belong to it only by accident” (*Meta.* VII, 3 [1029a 20-21, 24-25]).

particles (this would not be a substantial but an accidental change) or a total annihilation of  $S_1$  and coming to be out of nothing of  $S_2$ . Rather, due to primary matter as principle of potentiality underlying all existing substances, we observe the continuity of the process of  $S_1$  changing into  $S_2$ .

Concerning formal cause, Aristotle situates himself in a radical opposition to the transcendental character of Ideas in Plato. For him forms do not exist in a supernatural realm, nor are they imitated imperfectly by the mundane reality. To the contrary, according to Aristotle forms must be in things, determining their actuality. This becomes clear from the quotations from *Physics* and *Metaphysics* cited above. In both passages, Aristotle, speaking of formal causality, uses the term “ὁ λόγος τοῦ τί ἦν εἶναι,” which Gaye translates as “the statement of the essence,” and Ross as “the definition of the essence.”<sup>21</sup> Form is for him a principle of each existing substance that makes it to be the particular kind of thing it is – a metaphysical principle of actualizing (determining) a pure possibility-of-being (primary matter) to be a concrete substance. Even if Aristotle uses other terms to describe formal cause—including μορφή and εἶδος, which translate as “shape” and “appearance”—it is “ὁ λόγος τοῦ τί ἦν εἶναι,” that gives us the best grasp of what Aristotle meant by substantial form.<sup>22</sup> As an actualizing factor, it becomes a principle of novelty and an active source of change in causal processes. Hence, even if in a process of substantial change from  $S_1$  to  $S_2$  primary matter does not change, we distinguish  $S_1$  and  $S_2$  as separate substances due to different forms that inform primary matter in them and are educed from its potentiality. Moreover, substantial form is not only responsible for actualizing primary matter in particular kinds of things. Together with accidental forms—which are responsible for secondary properties of a given substance (such as its size or color) and may change without it changing its identity—substantial form disposes primary matter to particular substantial changes and not others, such that a wooden log put into a fire changes into ash and not into a bird.<sup>23</sup>

It is true that material and formal causes—which Aristotle found necessary for an explanation of the very nature of living and nonliving things, as well as their stability and change—may seem to the contemporary researcher of nature, at first glance, abstract, incomprehensible,

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<sup>21</sup> *Phys.* II, 3 (194b 26); *Meta.* V, 2 (1013a 27).

<sup>22</sup> Note that it is μορφή that gave the origin to the term “hylomorphism,” despite the fact that it is not the most accurate depiction of what Aristotle understands by formal cause.

<sup>23</sup> Consequently, Aristotle recognizes an ascending gradation in the perfection of beings in nature. On his *scala naturae* we can observe a gradual crescendo from non-living, through plant and animal, to human forms, which is an outcome of a proper disposition of primary matter to be informed by a proper kind of substantial form: “[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” (*Par. an.* IV, 5 [681a 12-15]).

difficult to defend, or even unnecessary and spurious. The situation changes, however, once we refer Aristotelian principles to the modern theory of information with its emphasis on the immaterial nature of information propagating in the universe since the initial Big Bang, and quantum mechanics with its thesis that each elementary particle is not so much a physical object but a fluctuation in the potential of the quantum field (a local coherence of quantum vacuum).<sup>24</sup> Even if there is no direct reference between these concepts, it seems that the contemporary theory of information and contemporary physics bring us closer to Aristotle's philosophy of nature and his metaphysics than ever, since it was rejected with the advent of the scientific revolution in the seventeenth century. Hence, it seems the idea of information in-forming all existing entities in the universe, and the concept of quantum field underlying the very fabric of the cosmos can be—with all caution and awareness of methodological differences between natural science and metaphysics—related to formal and material causes as defined by Aristotle.

#### IV. Hylomorphic Metaphysics of Evolutionary Transformations

The heuristic value of hylomorphism goes even further. Offering a crucial metaphysical background for the ontology of irreducibly complex biological systems, it also becomes a fitting metaphysics for the philosophical analysis of an evolutionary transformation. In reference to Moreno and O'Rourke, we may describe each evolutionary change as a series of accidental changes in the structure of genetic material (DNA), affecting the disposition of primary matter in-formed (actualized) by substantial forms of organisms in a given lineage of a species  $S_i$ , and leading to a precise instant at which the primary matter underlying the egg and the sperm coming from parental

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<sup>24</sup> Although the history of the term “information” goes all the way back to ancient Greece, philosophy of information as a separate discipline is rather new. The context of its origin was the modern empirical theory of knowledge, as well as mathematical concepts of information and related to them new information technologies which were developed in the twentieth century. The first challenge that philosophy of information faces is the definition of its main point of interest. It becomes obvious that the popular definition of “information” as the equivalent of some portion of data, code, or text—written, sent, received, or manipulated in a given medium—is not sufficient. An attempt at specifying its nature at the meta-level of description gave an origin to a set of definitions concentrating on its quantitative (theories of Fisher, Shannon, Kolmogorov, or quantum theory of information), or qualitative aspects (theory of information as the state of a subject or the semantic theory of information offered by Carnap). Some thinkers suggest a pluralist approach to the definition of information, similar to the definition of energy in physics, which refers to potential, kinetic, electric, chemical, and nuclear types of energy. The classical approach to information, which is a point of departure for our analysis, refers it to both theory of knowledge (epistemology) and theory of being (ontology and metaphysics). See P. Adriaans (2012) *Information*, in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Fall 2013, <https://plato.stanford.edu/archives/fall2013/entries/information/>.

organisms of  $S_1$ , when joined, is not disposed to the “old” substantial form of the species  $S_1$ , but to a “new” substantial form of a new species  $S_2$ , educed from its potentiality (see **fig. 1**).<sup>25</sup>



SF = substantial form  
 PM = primary matter  
 $S_1, S_2$  = species 1 and 2

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

It takes many mutations (outcomes of which are regulated by natural selection) to produce such an effect, and its actual occurrence may be extremely difficult (if not impossible) to capture. But this does not exclude the possibility of its occurring, especially in a situation where some members of a species migrate to a new environment and can be modified gradually 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 left much room for such a possibility.<sup>26</sup>

<sup>25</sup> Gametes, parental egg and sperm, are separate entities and should be treated as instrumental causes, so that, normally, when united, their primary matter is disposed to the original substantial form of the type  $S_1$ . In case of an evolutionary transition, however, accidental changes in the DNA of the parental organisms that produced given egg and sperm may dispose their primary matter in such a way that, when united, a new substantial form of the type  $S_2$  is educed from the potency of the primary matter.

<sup>26</sup> See Antonio Moreno, “Some Philosophical Considerations on Biological Evolution,” *The Thomist* 37, no. 3 (1973), 429-31; Fran O’Rourke, “Aristotle and the Metaphysics of Evolution,” *The Review of Metaphysics* 58 (2004), 26-27: “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” (*ibid.*, 27). In other words, even if contemporary biology is willing to acknowledge the reality of distinct species only at given points in time (due to constant genetic and phenotypic changes of organisms), it seems to us that the Aristotelian categories of potency/act and primary matter/substantial form provide a sufficient ground for accommodating both essentialist and processual aspects of living beings. On the defense of essentialism in biology see Michael Devitt, “Resurrecting Biological Essentialism,” *Philosophy of Science* 75, no. 3 (2008): 344-82; Olivier Rieppel,

## V. The Importance of *Esse* and its Influence on Aquinas's Definition of Creation

After he became familiar with and adopted Aristotle's hylomorphism, Thomas Aquinas made an original metaphysical discovery that proved crucial for his entire system of philosophy and theology. He realized that primary matter and substantial form, defining the essence (*essentia*) or nature of any contingent entity are not identical with its act of existence (*esse*). Thus, he introduced one more ontological composition characteristic of each contingent being – the one of essence and existence. He also regarded *esse* as the most perfect among all principles:

Being properly signifies: something-existing-in-act (*ST I*, q. 5, a. 1, ad 1). [It] means that-which-has-existence-in-act (*In Meta.* XII, lect. 1 (§ 2419)). [Hence,] being ... is the actuality of all acts, and therefore the perfection of all perfections (*Q. de pot.* q. 7, a. 2, ad 9). [It is] innermost in each thing and most fundamentally inherent in all things since it is formal in respect of everything found in a thing (*ST I*, q. 8, a. 1, co.). [Taken simply,] as including all perfection of being, [*esse*] surpasses life and all that follows it (*ST I-II*, q. 2, a. 5, ad 2).

Moreover, shifting his reflection toward a theological analysis of the perfection of *esse* Aquinas attributes its primary source to the Creator who is the only being in whom *esse* is identical with his essence (*essentia*). He thus claims all creatures have their own *esse* by participation in God's *esse*:

[B]eing itself belongs to the first agent according to His proper nature, for God's being is His substance (*SCG II*, 52, no. 8). In Him essence does not differ from existence (*ST I*, q. 3, a. 4, co.). Since therefore God is subsisting being itself, nothing of the perfection of being can be wanting to Him (*ST I*, q. 44, a. 1, co.) [*Esse*] belongs to all other things from the first agent by a certain participation (*ST I*, q. 4, a. 2, co.). God alone is actual being through His own essence, while other beings are actual beings through participation, since in God alone is actual being identical with His essence (*SCG III*, 66, no. 7).<sup>27</sup>

His strong emphasis on the importance of *esse* and its ultimate origin in the divine being of God leads Aquinas to define *creatio ex nihilo* not as any kind of motion or change but bringing into existence (into being) something that has not existed before:

[W]hat is created, is not made by movement, or by change (*ST I*, 45, 3, co.). Creation is not change (*ST I*, q. 45, a. 2, ad 2). [B]eing is the most common first effect and more intimate than all other effects: wherefore it is an effect which it belongs to God alone to produce by his own power (*Q. de*

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"New Essentialism in Biology," *Philosophy of Science* 77, no. 5 (2010): 662–73; Travis Dumsday, "Is There Still Hope"; and Christopher J. Austin, "Aristotelian Essentialism: Essence in the Age of Evolution," *Synthese* 194, no. 7 (2017): 2539–56.

<sup>27</sup> See also *ST I*, q. 4, a. 3, ad 4; q. 104, a. 1, co.; *In I Sent.* d. 37, q. 1, a. 1, co.; *Q. de ver.* q. 5, a. 8, ad 9; *SCG III*, 65, no. 3; *Super de causis*, 24. On the meaning of *ipsum esse subsistens* see Rudi A. te Velde, *Participation*, 119–25. On the way Aquinas introduces the concept of *esse* in his writings see John F. Wippel, *The Metaphysical Thought of Thomas Aquinas: From Finite Being to Uncreated Being* (Washington D.C.: Catholic University of America Press, 2000), 238–53.

*pot.* q. 3, a. 7, co.). [I]t must be that all things which are diversified by the diverse participation of being, so as to be more or less perfect, are caused by one First Being, Who possesses being most perfectly (*ST I*, q. 44, a. 1, co.). [T]he proper effect of God creating is what is presupposed to all other effects, and that is absolute being (*ST I*, q. 45, a. 5, co.).

Consequently, thinking of what more contemporary theologians distinguish as *creatio continua*, we may refer it to Aquinas's emphasis on a continual dependency of creatures on God in their being:<sup>28</sup>

[C]reation in the creature is only a certain relation to the Creator as to the principle of its being (*ST I*, q. 45, a. 3, co.) [T]he being of every creature depends on God, so that not for a moment could it subsist, but would fall into nothingness were it not kept in being by the operation of the Divine power (*ST I*, q. 104, a. 1, co.).<sup>29</sup>

An important clarification needs to be added at this point, which will prove crucial for our model of divine and natural causality in evolution. Even though Aquinas clearly states that *esse* has its ultimate source and can only be “produced” by God, he admits that creatures can be causes of coming into existence of other created entities. As such, they may be called causes but not of existence (*esse*) as such, (*i.e.*, *causa essendi*) but of coming into existence, (*i.e.*, *causa fiendi*).<sup>30</sup> In other words, they may be called secondary causes of coming into existence (acting under the primary causation of God), but only instrumental causes of existence as such. For even if all actions of efficient causality involve a bestowal of existence (being), whether substantially or accidentally, no creature can be a source of existence for another creature. It “gives” something that is beyond

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<sup>28</sup> It is important to remember that the act of Creator sustaining being of his creatures in time can—and for Aquinas must—be still eternal (timeless). In other words, one does not have to reject Aquinas's concept of divine eternity as timeless to defend the idea of *creatio continua*.

<sup>29</sup> On the unity of *creatio ex nihilo* and *creatio continua* see Rudi A. te Velde, *Aquinas on God: The “Divine Science” of the Summa Theologiae* (Aldershot, Hants, U.K.: Ashgate, 2006), 125.

<sup>30</sup> See *In I Sent.* d. 7, q. 1, a. 1, ad 3; *Q. de ver.* q. 5, a. 8, ad 8; *Q. de pot.* q. 5, a. 1; *ST I*, q. 104, a. 1. It is worth noticing that in his *In Sent.* Thomas might be considering the plausibility of the emanationist view of creation in which intermediate spiritual creatures are instruments of the creation of lower creatures as such. Since he gave up this idea in his later works, the same claim that created entities can be instrumental causes of coming into existence (becoming) but not of existence as such (being) should be understood as an emphasis on the fact that creatures cannot, *sensu stricto*, create anything. Only the cause of existence (*esse*) as such can be called the creator and this is God. Creatures are merely instruments of coming into existence of other creatures. Note that this view is not occasionalist as the action of creatures is not only apparent, while everything is, in fact, caused by God. For Aquinas causation of secondary and instrumental causes is real and autonomous within the immanent order of causation, while it always depends on the primary and principal causation of God.

The phrase “as such”—introduced here and used repeatedly in the remaining sections of the article in reference to the metaphysical categories of existence and essence (including primary matter and substantial form)—is thought as a way of describing them in a more static aspect of what they are. It is contrasted with the complementary dynamic side of the same metaphysical categories, expressed in terms such as “coming into existence (into being),” “informing (actualizing) primary matter,” “educing (eduction of) substantial form from the potentiality of primary matter.”

its own capacities to offer, or rather provides some suitable circumstances in which God bestows *esse* on a new contingent entity. Hence, contingent entities must be classified as instrumental causes of being as such (*esse*), dependent on the principal agency of God, the only source of being:

[N]o lower agents give being except in so far as they act by divine power. Indeed, a thing does not give being except in so far as it is an actual being. But God preserves things in being by His providence... Therefore, it is as a result of divine power that a thing gives being (*SCG* III, 66, no. 1-2).<sup>31</sup>

There is one more important thing we should mention. Following Aquinas in his emphasis on the importance of *esse*, we must not forget that creation for him is not limited to the fact of the dependency of contingent entities on God in existence but also entails their dependency on the Creator in their essence. In fact, on several occasions Aquinas emphasizes that all four Aristotelian types of causation, and even the *per accidens* (*i.e.*, quasi-causal) character of chance—all of them being crucial for explaining the way things are, remain stable and change into one another—have their ultimate origin and source in God. This fact can be explained as follows:

1. **Material cause.** Although it would be erroneous to assert that God (total actuality) is the ultimate primary matter (total potentiality) of each being, primary matter does come from God and retains a likeness to him: “also primary matter is created by the universal cause of being” (*ST* I, q. 44, a. 2, co.). God’s action finds its expression in creating and providing primary matter as a source and principle of potentiality, and of all changes in nature.
2. **Formal cause.** Because formal cause reduces primary matter from potentiality to act, we may appropriately consider God as the ultimate source of formal causation. Hence, states Thomas, “Form is something divine and very good and desirable.” The reason we can say it is divine is because “every form is a certain participation in the likeness of the divine being, which is pure act. For each thing, insofar as it is in act, has form” (*In Phys.* I, lect. 15 [§ 135]). In other words, through their substantial form, creatures possess, in part, the actuality that

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<sup>31</sup> See also *SCG* III, 67, no. 1; *SCG* II, 21; *Q. de pot.* q. 3, a. 7, co.; ad 3; ad 16; *Q. de pot.* q. 5, a. 1, co.; *ST* I, q. 45, a. 5, co.; q. 104, a. 1, co. Wippel notes that “[F]or Thomas, whenever a new substance is efficiently caused by a natural or created agent, that agent’s causation applies both to the act of being itself (*esse*) of the new substance and to a particular determination of *esse* as realized in that substance. Causation of the particular determination (this or that kind of form) is owing to the created efficient cause insofar as it operates by its own inherent power as a principal cause. Causation of the act of being itself (*esse*) is assigned to it as an instrumental cause acting with the power of God and to God himself as the principal cause of the same. From this it follows that one should not maintain that Thomas denies that created causes can efficiently cause the act of existing or the act of being, at least in the process of bringing new substances into being” (Wippel, *The Metaphysical*, 213).

is infinite in the Creator. Consequently, God can be said to act in the world as the Creator of all forms and the source of all actuality.<sup>32</sup>

3. **Efficient cause.** Aquinas sees God as the first source of all efficient causation. He states, “all agents act in virtue of God himself: and therefore He is the cause of action in every creature” (*ST I*, q. 105, a. 5, co.). He thinks that the likeness between the agent, *i.e.*, the efficient cause, and its effects observed in nature, makes it unreasonable to pass over the natural generators of substantial forms and to claim that God obviates the causality of natural agents. It is this way of thinking that makes him suggest distinctions between primary and secondary and between principal and instrumental causation of God and his creatures—distinction which we have already discussed above.
4. **Final cause.** Similar to other modes of causation, all forms and cases of natural teleology (which Aquinas calls after Aristotle a “cause of causes”) find their ultimate source in God. He notes that “the end of all things is some extrinsic good,” which is “outside [extrinsic to] the universe” (*ST I*, q. 103, a. 2, co.). It is desired by all creatures as they are looking for the fulfillment of their nature. In other words, ἐντελέχεια, an ultimate actualization of form in the final state of an entity, bears some likeness to God and his goodness. It brings Aquinas to the conclusion that “everything is (...) called good from the divine goodness, as from the first exemplary effective and final principle of all goodness” (*ST I*, q. 6, a. 4, co.). Consequently, we may assert that “All things desire God as their end, when they desire some good thing, whether this desire be intellectual or sensible, or natural, *i.e.* without knowledge; because nothing is good and desirable except forasmuch as it participates in the likeness to God” (*ST I*, q. 44, a. 4, ad 3.).
5. **Chance.** Thomas agrees with Aristotle that chance and fortune are not causes *per se*. At the same time, as *per accidens* types of causality, they must be related to proper material, formal, efficient, and final causes, relevant to entities and dynamical systems in which they occur (see *In Phys.* II, lect. 7-10 [§ 198-238], especially § 218). As such, chance events are classified as contingent events, which Aquinas sees as remaining under God’s providence: “God, Who is the governor of the universe, intends some of His effects to be established by way of necessity, and others contingently” (*SCG III*, 94, no. 11.). “Things are said to be fortuitous as

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<sup>32</sup> At this point Aquinas goes beyond the metaphysics of Aristotle and his theory of intrinsic formal causation, introducing the Platonic idea of external exemplar forms (causes), which he sees not as subsisting entities, but as ideas in the mind of God: “[I]n the divine mind there are exemplar forms of all creatures, which are called ideas, as there are forms of artifacts in the mind of an artisan” (*Quod.* 8, 2).

regards some particular cause from the order of which they escape. But as to the order of Divine providence, 'nothing in the world happens by chance,' as Augustine declares" (ST I, q. 103, a. 7, ad 2.).

All four causes (material, formal, efficient, and final), as well as the quasi-causality of chance occurrences, are crucial for the eduction of a given substantial form from the potentiality of primary matter in each substantial change. They may be thus classified as causes of the essence of a new entity that comes into being. In analogy to the perfection of *esse*, we must say that God as Creator of primary matter and all forms, source of efficient causality and natural teleology, as well as the transcendent cause of the occurrences attributed to chance and fortune, is the first and ultimate cause of the essence (*essentia*) of each contingent entity. At the same time, created agents can be regarded both as secondary causes of essences of other contingent beings, *i.e.*, secondary causes of the eduction of a given substantial form from the potentiality of primary matter (also through properly disposing it to go through a suitable substantial change), as well as instrumental causes of the essence (*essentia*) as such of a given being (dependent on the principal causality of God).

Consequently, to be created means for Aquinas to be dependent on God in *esse* and in *essentia* (in existence and in essence). This rule applies both to entities that came into being *ex nihilo* at the beginning of creation and existed or still exist in time, as well as to those that come into being throughout the history of the universe from already existing matter, due to causality of other creatures. The latter can be classified as secondary causes of the essence (*essentia*) of a given entity (through the eduction of a proper substantial form from the potentiality of primary matter) and instrumental causes of the essence as such, as well as secondary causes of coming into existence (*esse*) of the entity in question and instrumental causes of its existence as such.<sup>33</sup>

## VI. On the Possibility of Creation Through Biological Evolution

Our description of the meaning of creation within the framework of the Aristotelian-Thomistic system of philosophy and theology enables us to suggest an answer to the question concerning the possibility of creation through the processes of biological evolution, understood in terms of the universal common descent.<sup>34</sup> While the vast majority of contemporary Thomists claim

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<sup>33</sup> The origin of each new human being is an exception here. Aquinas believes God creates an immortal soul *ex nihilo* when a new human person begins to exist.

<sup>34</sup> Although a similar answer might be given with respect to chemical and biochemical evolution, our concern here is evolution in the realm of animate matter.

that this version of theistic evolution is consistent with their master’s teaching,<sup>35</sup> Michael Chaberek—a supporter of the theory of intelligent design—finds it rather at odds with some fundamental elements of Aquinas’s system of thought and claims that the only evolutionary model that can be accepted is a version of progressive creation, *i.e.*, a diversification of species from ancestral, divinely produced, “natural species.”<sup>36</sup>

An attempt at answering the question regarding which of these two versions of evolutionary theory might be acceptable within the framework of the Thomistic philosophy and theology—when based on the selection of some crucial passages from the works of Aquinas concerning creation and species—does not seem to effect in a clear-cut solution to the problem (see **tab. 1**). Hence, what we aim to offer hereafter is a new interpretation of the classical Thomistic notion of creation—based on *ST I*, qq. 44-49, *ST I*, qq. 65-74, and parallel texts in other works of Aquinas—in reference to some most fundamental principles of his own metaphysics (remembering its roots in the thought of Aristotle). We believe that such interpretation will enable us to argue in favor of the plausibility of the theory of evolution, understood in terms of the universal common descent, within the Thomistic system of thought. We think it is possible despite the common and, in a way, simplistic opinion that Aquinas himself considered creatures to be capable only of acting as instrumental causes of new members of their own species or kind and held that the first members of each kind were produced by God without ancestors.

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<sup>35</sup> Apart from the already mentioned works by Austriaco *et al*, Carroll, Donceel, Luyten, Maritain, Mc Mullin, Moreno, Nogar, and O’Rourke, see Michael J. Dodds, *Unlocking Divine Action: Contemporary Science and Thomas Aquinas* (Washington D.C.: Catholic University of America Press, 2012); Ryan Fainche, “Aquinas and Darwin,” in *Darwin and Catholicism: The Past and Present Dynamics of a Cultural Encounter*, ed. Louis Caruana (London ; New York: T&T Clark, 2009), 43–59; Étienne Gilson, *From Aristotle to Darwin and Back Again: A Journey in Final Causality, Species, and Evolution* (Notre Dame, IN: Notre Dame Press, 1984); George P. Klubertanz, “Causality and Evolution,” *Modern Schoolman* 19 (1941): 11–14; Gerard M. Verschuuren, *Aquinas and Modern Science: A New Synthesis of Faith and Reason* (Kettering, OH: Angelico Press, 2016).

<sup>36</sup> The main argument by Chaberek can be found in his *Aquinas and Evolution* (Lexington: The Chartwell Press, 2017). It is similar to the position proposed by the Jesuit Erich Wasmann in 1906 (English translation: *Modern Biology and the Theory of Evolution* [London: Kegan Paul, Trench, Trübner & Company, 1910]). James Hofmann, in his forthcoming article on the legacy of the concept of “natural species” in the Catholic debate on evolution mentions and analyzes other thinkers using this term in their argumentation such as: Hermann Muckermann, Joseph Gretd, Richard P. Phillips, Mortimer Adler, and Anthony C. Cotter. It is known that in the second edition of *The Origin* (page 481, Peckham ed. 1959, page 748) Darwin referred with an approval to the letter of Charles Kingsley, who – accepting the idea of what we might call “natural species” – claimed: “I have gradually learnt to see that that it is just as noble a conception of deity to believe that he created primal forms capable of self development (...) as to believe that he required a fresh act of intervention to supply the lacunas which He himself had made” (Letter from Charles Kingsley, 18 November 1859, <https://www.darwinproject.ac.uk/letter/DCP-LETT-2534.xml>). Hofmann claims that Chaberek’s use of the concept of “natural species” is retrograde as it did not stand up to the criticism of the contemporary biological science.

**Table 1.** Selection of the passages from the works of Aquinas showing the complexity of the debate on the possibility of creation through biological evolution within his system of philosophy and theology.

On the possibility of creation of new species	<i>De pot.</i> q. 4, a. 2, ad 22	“In its beginning the universe was perfect with regard to its species ( <i>quantum ad species</i> ).”
	<i>ST</i> I, q. 69, a. 2, co.	“[T]he first constitution of species belongs to the work of the six days, but the reproduction among them of like from like, to the government of the universe.”
	<i>ST</i> I, q. 118, a. 3, ad 2	“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.”
	<i>ST</i> I, q. 73, a. 1, ad 3	“Nothing entirely new was afterwards made by God, but all things subsequently made had in a sense been made before in the work of the six days. (...) Species, also, that are new, if any such appear, existed beforehand in various active powers; so that animals, and perhaps even new species of animals, are produced by putrefaction by the power which the stars and elements received at the beginning. Again, animals of new kinds arise occasionally from the connection of individuals belonging to different species, as the mule is the offspring of an ass and a mare; but even these existed previously in their causes, in the works of the six days. Some also existed beforehand by way of similitude, as the souls now created.”
	<i>In I Sent.</i> d. 44, q. 1, a. 2, co.	“[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.”
On the possibility of creation through biological evolution (transformism)	<i>ST</i> I, q. 45, a. 5, co.	“[I]t is impossible for any creature to create, either by its own power or instrumentally—that is, ministerially.”
	<i>ST</i> I, q. 65, a. 3, co.	“[N]o secondary cause can produce anything, unless there is presupposed in the thing produced something that is caused by a higher cause. But creation is the production of a thing in its entire substance, nothing being presupposed either uncreated or created. Hence it remains that nothing can create except God alone, Who is the first cause. Therefore, in order to show that all bodies were created immediately by God, Moses said: ‘In the beginning God created heaven and earth’.”
	<i>ST</i> I, q. 65, a. 4, co.	“[I]n the first production of corporeal creatures no transmutation from potentiality to act can have taken place, and accordingly, the corporeal forms that bodies had when first produced came immediately from God, whose bidding alone matter obeys, as its own proper cause.” <sup>37</sup>

<sup>37</sup> Aquinas’s notion of an immediate derivation of “corporeal forms” of first exemplars of animate creatures effected by God raises the question of whether what he meant was a direct intervention of God in the origin of each new species. An answer to this question is rather complex. Commenting on the second book of *Sentences* of Lombard (d. 14, q. 1, a. 5, ad 6) Aquinas claims that the origin of plants requires merely causal principles proper for the work of distinction (*opus distinctionis* – we will say more about it below), and adds that the role of the father in this process belongs to the powers of celestial bodies, while the role of the mother is fulfilled by the primordial matter (elements – see below). Similar is his opinion presented in *De Pot.* q. 3, a.2, ad 28: “Now the production of plants from the earth into actual existence belongs to the work of propagation, since the powers of the heavenly body as father, and of the earth as mother suffice for their production. Hence the plants were not actually produced on the third day but only in their causes: and after the six days they were brought into actual existence in their respective species and natures by the work of government.” The case of animals might look different. Concerning their origin Aquinas emphasizes that “[T]hose things that are naturally generated from seed cannot be generated naturally in any other way. (...) [I]n the natural generation of all animals that are generated from seed, the active principle lies in the

<i>SCG</i> III, 66, no. 4, 6	“[B]eing is the proper product of the primary agent, that is, of God; and all things that give being do so because they act by God’s power. ... [S]econdary agents, which are like particularizers and determinants of the primary agent’s action, produce as their proper effects other perfections which determine being.”
<i>In II Sent.</i> d. 12, q. 1, a. 2, co.	“[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.”
<i>De pot.</i> q. 5, a. 1, co.	“[T]his incorporeal agent by whom all things, both corporeal and incorporeal are created, is God, as we have proved above ( <i>De pot.</i> , q. 3, aa. 5, 6, 8), from whom things derive not only their form but also their matter. And as to the question at issue it makes no difference whether they were all made by him immediately, or in a certain order as certain philosophers have maintained.” <sup>38</sup>
<i>De pot.</i> q. 3, a. 10, ad 2	“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.”
<i>De pot.</i> q. 4, a. 2, co.	“[W]hen he [God] made things out of nothing he did not at once bring them from nothingness to their ultimate natural perfection, but conferred on them at first an imperfect being, and

formative power of the seed. (...) The material principle, however, in the generation of either kind of animals, is either some element, or something compounded of the elements. But at the first beginning of the world the active principle was the Word of God, which produced animals from material elements, either in act, as some holy writers say, or virtually, as Augustine teaches” (*ST I*, q. 71, ad 1; see also *In II Sent.* dist. 14, a. 5, ad 6). This theological opinion of Aquinas leaves space for an interpretation assuming a direct divine intervention in the production of each animal species (see also the passage from *In II Sent.* d. 1, q. 1, a. 4, co. in the second section of the table, which seems to argue even stronger in favor of the necessity of such an intervention). At the same time, however, it is possible to think that, similar to the case of plants, the “virtual” presence of animals as *rationes seminales* in the primitive matter required merely the “regular” work of government for them to become actualized. Divine intervention in their origin would then refer – again, similar to the case of plants – merely to the instantiation of their proper *rationes seminales*.

Note that when Thomas emphasizes that “the corporeal forms that bodies had when first produced came immediately from God” (*ST I*, q. 65, a. 4, co.), he speaks about immediate origin of forms from God in opposition to Plato and Avicenna who thought corporeal forms were derived from spiritual substances (see our comment in note 30). At the same time, we need to remember that Aquinas does speak about causal influence of spiritual (separated) substances (angels) in creation: “Corporeal forms, therefore, are caused, not as emanations from some immaterial form, but by matter being brought from potentiality into act by some composite agent. But since the composite agent, which is a body, is moved by a created spiritual substance, as Augustine says (*De Trin.* III, 4,5), it follows further that even corporeal forms are derived from spiritual substances, not emanating from them, but as the term of their movement” (*ST I*, q. 65, a. 4, co.). Moreover, in reference to Aristotle’s cosmology, he also speaks about the influence of the celestial bodies (sun and stars) on the events taking place on earth: “The heavenly bodies inform earthly ones by movement, not by emanation” (*ST I*, q. 65, a. 4, ad 3). See also *SCG* III, 67, no. 5; *SCG* III, 69, no. 24; *ST I*, q. 118, a. 1, ad 3; *Q. de pot.* q. 3, a. 8, ad 15. Both of these claims are intriguing and defensible philosophically and theologically. However, we must remember that separated substances and celestial bodies are not mediators of divine action, but participants entering a complex nexus of secondary and instrumental causes engaged in substantial transformations taking place in the universe.

<sup>38</sup> “The first explanation of these things namely that held by Augustine [things were made in a certain order] is the more subtle, and is a better defense of Scripture against the ridicule of unbelievers: but the second [things were made immediately] which is maintained by the other saints is easier to grasp, and more in keeping with the surface meaning of the text. Seeing however that neither is in contradiction with the truth of faith, and that the context admits of either interpretation, in order that neither may be unduly favored we now proceed to deal with the arguments on either side” (*De pot.* q. 4, a. 2, co.).

		afterwards perfected them, so that the world was brought gradually from nothingness to its ultimate perfection.”
	<i>De pot.</i> q. 5, a. 5, ad 13	“God in bringing all creatures into being out of nothing, himself instituted the first perfection of the universe, consisting in the principal parts thereof, and the various species of things: and that in order to give it its final perfection, consisting in the completion of the ranks of the blessed, he ordained the various movements and operations of creatures, some of which are natural, for instance, the movement of the heavens and the activities of the elements, whereby matter is prepared to receive rational souls, while others are voluntary such as the ministrations of the angels who are sent to minister for them who shall receive the inheritance of salvation.”
	<i>In II Sent.</i> d. 1, q. 1, a. 4, co.	“[Some things come into being neither through motion nor through generation] because of the necessity that generation always generates what is similar in species. For this reason the first members of the species were immediately created by God, such as the first man, the first lion, and so forth. Man, for instance, can only be generated from man. It is, however, otherwise with those things which are not generated by an agent that is similar to them in species. For these, rather, the power of celestial bodies along with appropriate matter is sufficient, as, for example, those things which are generated by putrefaction.” <sup>39</sup>

What is crucial, in our opinion, is the fact that creation *ex nihilo* in Aquinas’s treatise on the work of the six days refers first and foremost to the act of coming into being out of nothing (*i.e.*, not from a preceding being of any kind) of the most primitive types of contingent entities, *i.e.*, the elements. Distinguishing the work of creation (*opus creationis*) from those of distinction (*opus distinctionis*) and adornment (*opus ornatus*), Aquinas notes that it is, in fact, inseparable from the first three stages of distinction, the second of which is the distinction “of the elements according to their forms.” And even if only earth and water are named, adds Thomas, the author of Genesis 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. (*ST I*, q. 66, a. 1, ad 2 *sed cont.*).

It seems that for Aquinas the subsequent creation of more complex contingent beings is in a way mediated through those most basic forms of material stuff. Not in a sense that these primitive entities would have the power to create – they cannot possess the power which belongs only to

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<sup>39</sup> Steven Baldner and William Carroll offer a commentary to this passage in their translation of Aquinas’s work: “Aquinas, following the ancients, thought that worms, for instance, could be generated from the rotting of garbage. The garbage had to have the appropriate matter (the right active and passive qualities) and the action of a celestial body (the sun) was required. The biology here is incorrect, of course, but the philosophical point is what is important. Aquinas is saying that animal and plant generation need not, in principle, always take place from parent members of the species. That such, in principle, could happen is needed for a doctrine of evolution. Aquinas, of course, did not hold a doctrine of evolution, but the point that he is making here is important if his philosophy is to be held to be compatible with a doctrine of evolution” (Saint Thomas Aquinas, *Aquinas on Creation: Writings on the “Sentences” of Peter Lombard, Book 2, Distinction 1, Question 1*, trans. Steven E. Baldner and William E. Carroll [Toronto: Pontifical Institute of Mediaeval Studies, 1997], 85, footnote 51).

God. And yet, more complex entities, in some respect, came “from” them. For it was the earth, reads Aquinas, that brought forth plants: the green herbs and fruit trees. It was water that brought forth an abundance of swimming creatures and birds (although Genesis does not say explicitly where they came from). It was earth that brought forth all kinds of living creatures: cattle, creeping things, and wild animals of all kinds. Although it is not quite clear whether he wholly embraced Augustine’s theory of *rationes seminales* (seminal notions), Aquinas refers to his suggestion that plants and trees might have been produced “in their origin or causes,” *i.e.*, the earth “received ... the power to produce them.” They were subsequently brought into existence in “the work of propagation” (*ST I*, q. 69, a. 2, co.). Similarly with fishes and birds, which Augustine saw as produced by “the nature of waters on that [fifth] day potentially” (*ST I*, q. 71, co.), and animals, whose “production was potential” as well (*ST I*, q. 72, co.).

One might rightly say that Augustine thought all species were, in fact, already present in the work of the six days, but their presence in potency (*rationes seminales*) might be referred—within the system of Aristotelian-Thomistic metaphysics—to the potentiality of primary matter from which—provided it is properly disposed—any type of substantial form can be educed. Hence, what Aquinas qualifies as the work of propagation, might be seen as a gradual transformation disposing primary matter to be informed by particular types of substantial forms, typical of different and new kinds of species. The radical change comes with the origin of man, whose life, “as being the most perfect grade, is not said to be produced, like the life of other animals, by earth or water, but immediately by God” (*ST I*, q. 72, ad 1). What is meant here is that each human soul is directly created by God.

It is important to acknowledge that Aquinas does not seem to speak about the creation of more complex inanimate and animate species *ex nihilo*. He does say that “the corporeal forms that bodies had when first produced came immediately from God,” to which he adds “whose bidding alone matter obeys, as its own proper cause” (*ST I*, q. 65, a. 4, co.). This crucial passage is difficult to interpret. It needs to be read in reference to the fundamental difference Aquinas sees between generation and creation:

[Creation] presupposes nothing in the thing which is said to be created. In this way it differs from other changes, because a generation presupposes matter, which is not generated, but rather which is transformed and brought to completion through generation. In other changes a subject which is a complete being is presupposed. Hence, the causality of the generator or of the alterer does not extend to everything which is found in the thing, but only to the form, which is brought from potency into actuality. The causality of the Creator, however, extends to everything that is in the thing. And, therefore, creation is said to be out of nothing, because nothing uncreated pre-exists creation” (*In II Sent.*, 1, 1, 2, co.).

The problem is that although we speculatively distinguish between generation (which refers to the origin of an entity) and creation *ex nihilo* (which refers to its entire duration and existence), in reality we deal with entities that are both generated and, at least indirectly, created *ex nihilo*. In order to explain this metaphysical puzzle, we may say that all creatures are created *ex nihilo* in terms of their existence (*esse*), which is bestowed on them at any moment of their duration in time by God (whose action can be thus called *conservatio a nihilo*), as well as in their essence (*essentia*), since all substantial forms and primary matter as such come immediately from God. At the same time, concerning their coming into existence (being) and the act of the eduction of their substantial form from the potentiality of primary matter, they are generated in natural and contingent processes which engage many causal factors classified as secondary and instrumental causes. In other words, we might say that all contingent entities that come to be after the initial creation of the basic elements are created *ex nihilo* by the primary causal agency of God with reference to their *esse* and *essentia* taken as such. At the same time, they are generated by the secondary and instrumental agency of other creatures with reference to the change which effects their coming into existence (being) and the eduction of their substantial form from the potentiality of primary matter.<sup>40</sup>

With all this in mind, we can suggest an extension of Aquinas's doctrine of creation to include the theory of biological evolution, while obeying the principles of his system of thought. We might say that in the lineage of subsequent generations of organisms belonging to a given species  $S_1$ , a substantial change might occur which effects an actualization of properly disposed primary matter by a new substantial form belonging to the new species  $S_2$ . Paraphrasing Aquinas's assertion from *ST I*, q. 65, a. 4, co. we might say that the corporeal form (as such) that the first exemplar of the species  $S_2$  has when first produced comes immediately from God, while its eduction from the potentiality of primary matter effects from the secondary and instrumental causality of other creatures. The creatures in question act under the primary and principal causality of God, whose bidding alone (primary) matter obeys, as its own proper cause. Understood this way, an

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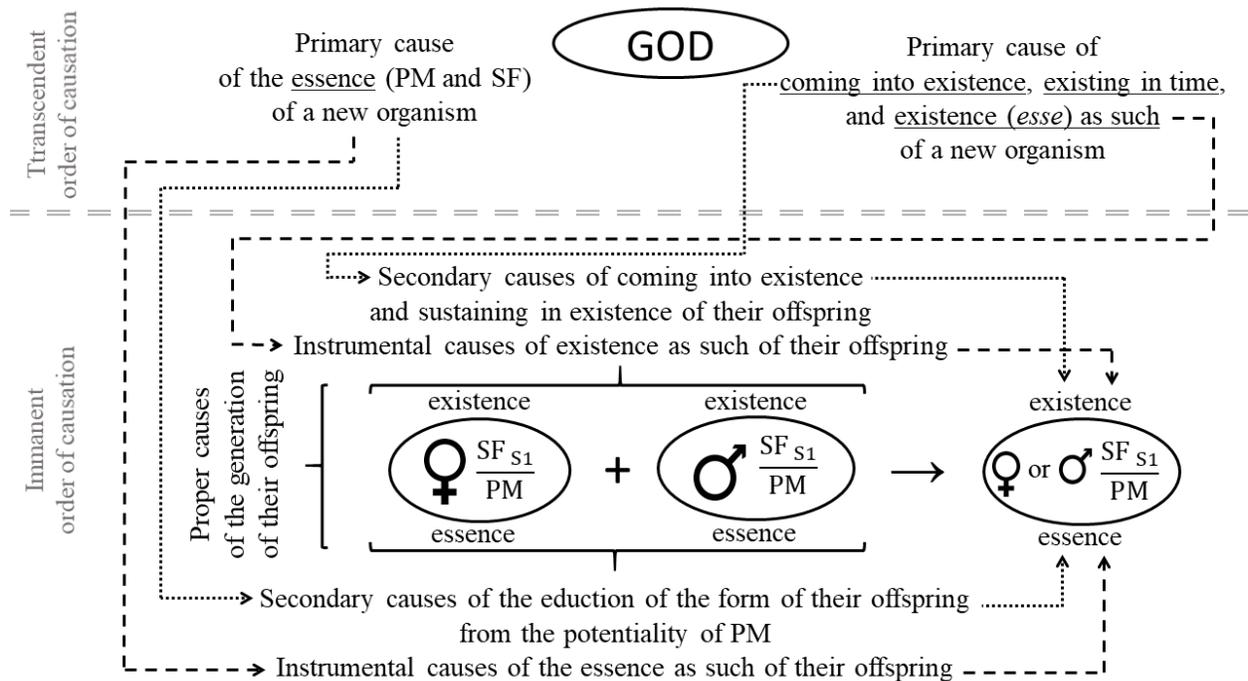
<sup>40</sup> This explanation becomes a practical application of the speculative philosophical and theological concept of *creatio ex nihilo*—defined in earlier parts of our analysis—in an interpretation of the creation story in Genesis. Following the first book of the Bible, it assumes the beginning of creation in time (or the beginning of time with creation). We must not forget, however, that in his philosophical analysis Aquinas assumed that the world might have been everlasting (*i.e.*, existing in time but with no beginning in time). In *ST I*, q. 46, a. 2, co. we find him saying: “By faith alone do we hold, and by no demonstration can it be proved, that the world did not always exist.” But even if the world is everlasting, it does not contradict the truth of its status of being created *ex nihilo*.

evolutionary change is neither simply generation, nor a direct creation *ex nihilo* (which in Aquinas’s interpretation of the work of six days seems to refer to the most basic elements). It is a change—similar to the majority of substantial changes in the realm of inanimate and animate nature—that brings together those two aspects of contingent entities (*i.e.*, being generated and created *ex nihilo*).

Naturally, an important question remains regarding a more thorough and exact causal description of this process (including the distinction between secondary and instrumental causes and specifying the nature of their action in an evolutionary transition) and a concern that it may be at risk of violating the key rule of Aquinas’s creation theology which ascribes the power to create only to God. We hope that our model of the divine and creaturely action in evolutionary transitions presented below will help to clarify these issues.

## VII. Concurrence of Divine and Natural Causes in Begetting Offspring

Having in mind all abovementioned principles of Aristotelian philosophy and Aquinas’s definition of creation, we can now present our model of divine and natural causes concurrent in evolutionary transformation of species. We will describe it within the framework distinguishing between the two related, yet distinct orders of causation: the immanent and the transcendent. We will begin from a regular case of giving birth to an organism of the same species (see **Fig. 2**).



SF = substantial form

PM = primary matter

S<sub>1</sub> = species 1

--> Principal causation of God working through instrumental causation of creatures

----> Primary causation of God working through secondary causation of creatures

**Figure 2.** Concurrence of divine and natural causes in begetting offspring of the same species

In the immanent order of causation, looking at parental organisms (♀ and ♂) in the process of generating their offspring, we perceive them simply as proper causes of such an occurrence. We say it is due to their natural causal activity that a new exemplar of the same species comes into being.<sup>41</sup> Applying principles of the metaphysics and theology of Aristotle and Aquinas, however, we distinguish, first, between essence and existence of the newly born organism. Analyzing its essence, we realize that the proper causal activity of the parents is not, in fact, a cause of primary matter and the substantial form as such of their offspring. Otherwise they would be causes of themselves, since each of them is also an exemplar of the same species in virtue of that form. The first and ultimate cause of the essence of each contingent entity can only be God, the Creator of primary matter and all substantial forms. Nothing prevents us, however, from attributing to parental organisms the role of instrumental causes of the essence of their offspring. Because their causal activity is accompanied by the instantiation of a new exemplar of their own species, it can be classified as instrumental for their offspring's essence taken as such. They make possible something which, strictly speaking, is beyond their own capacities to offer, *i.e.*, the fact of the actualization of primary matter by a right kind of substantial form of a given species (the principal cause of primary matter and substantial form is God).<sup>42</sup> Moreover, the same parental organisms can be categorized as secondary causes of the eduction of the proper substantial form from the potentiality of primary matter, in the process of begetting their offspring, *i.e.*, secondary causes of the process of instantiation of a particular

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<sup>41</sup> Proper cause (*causa propria*) can be understood as an individual or particular cause, as distinguished from a general or universal cause. Aquinas uses the term *causa propria* in *ST I*, q. 2, a. 2, co. As such, it seems to belong to the most preliminary and intuitive causal description of the stability and change of things in nature.

<sup>42</sup> “[A]ll forms are potentially in prime matter, but they are not actually there, as those who held the ‘hiddenness’ doctrine said. The natural agent produces not the form but the composite, by bringing form from potentiality to actuality. This natural agent by its own action is, as it were, an instrument of God Himself who, as agent, both makes the matter and gives it the potency for form” (*In II Sent.*, d. 1, q. 1, a. 4, ad 4).

exemplar of the substantial form of their own species in a given “portion” of a signate mater, which is a principle of individuation.<sup>43</sup> As such, they give what is within their natural dispositions to offer, while being dependent in their action on the primary causality of God, the source of all efficient action leading to the actualization of primary matter by various types of substantial forms and the ultimate end of natural teleology in all creatures.<sup>44</sup>

As for the existence (*esse*) of a new organism, conceived by its parents, its first and principal cause can only be God. This fact concerns not only the existence of each contingent being in the ontological meaning of this term (existence as such), but also each contingent entity’s coming into being (existence) and its further persistence in time (keeping in existence). God is the first and principal cause of creaturely *esse* in all three of these aspects. This is because *esse* has only one source, which is God, who always bestows it on his creatures (or rather allows them to participate in his own *esse*).

At the same time, it seems right to say that the operation of efficient causes (parental organisms acting in the immanent order of causation) is accompanied or followed by coming into being of their offspring, even though they are not first and principal causes (sources) of *esse* as such. Therefore, they can be described as secondary causes of coming into existence of their offspring, acting with the power given them by God – the transcendent and first source of all *esse* in the immanent order of created world. Note that we are talking here about secondary causation, since the causality of parental organisms which is followed by an instantiation (coming into being) of the *esse* of a new exemplar of their own species lies within their natural dispositions. Similarly, sustaining contingent entity in being (*esse*) is also the work of God as the primary cause. At the same time, it seems right to say God does that using secondary causes that work in the immanent

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<sup>43</sup> “Nature or quiddity [in substances composed of matter and form] is received in designated matter (*materia signata*). ... And because of the division of designated matter, the multiplication of individuals in one species is here possible” (*De ente* IV, 98). “Hence the form of the thing generated depends naturally on the generator in so far as it is educed from the potentiality of matter, but not as to its absolute existence” (*De pot.* q. 5, a. 1, co.).

<sup>44</sup> “Now it is clear that of two things in the same species one cannot directly cause the other’s form as such, since it would then be the cause of its own form, which is essentially the same as the form of the other; but it can be the cause of this form for as much as it is in matter—in other words, it may be the cause that this matter receives this form. And this is to be the cause of becoming, as when man begets man, and fire causes fire. Thus whenever a natural effect is such that it has an aptitude to receive from its active cause an impression specifically the same as in that active cause, then the becoming of the effect, but not its being, depends on the agent” (*ST* I, q. 104, a. 1, co.). See also *SCG* II, 21, no. 8; III, 65, no. 4; *ST* I, q. 13, a. 5, ad 1.

order of causation.<sup>45</sup> Hence, to give an example, parents of a newborn offspring taking care of its wellbeing should be considered as secondary causes of sustaining it in existence (*esse*). They realize their natural dispositions, while acting by the power of God, who is the first cause of *creatio continua*. Moreover, even if *esse* as such has God as its principal cause, contingent creatures can be considered as causing it instrumentally. They cannot “give” *esse*, but their agency brings or is accompanied by an instantiation of a new organism, which has *esse* bestowed on it by God.

Consequently, we can say that parental organisms giving birth to a new exemplar of their own species are: (1) proper causes of its coming into being (in a most basic and pre-philosophical causal explanation); (2) secondary causes of the instantiation of its essence (*i.e.*, the eduction of the appropriate form from the potentiality of primary matter), and of its coming into existence and keeping in existence (permanence in time) – dependent on the primary causality of God, the origin and source of all efficient causality effecting the actualization of primary matter by the variety of substantial forms and the ultimate end of natural teleology in creatures; and (3) instrumental causes of the new organism’s essence (*essentia*) and existence (*esse*) as such – dependent on the principal causation of God, the Creator of primary matter and all substantial forms, and the first and only source of *esse*. Note that creaturely *esse*, though having its primary and direct source in God (being *de facto* a participation in divine *esse*) is not the same as God’s *esse*. It is *esse* that does come from God but is proportionate to the essence (*essentia*) of a creature and not identical with it. Hence, we predicate *esse* of creatures analogously (using both analogy of attribution and of proper proportionality).

In other words, the same action of parental organisms, which are considered as proper causes of their own descendant within the immanent order of causation, 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 and principal cause of the essence and existence of every contingent being.

The distinction between primary and principal causation of God and the secondary and instrumental causation of creatures seems to be crucial here. It helps us avoid the two extreme positions of deism (God who created the universe and the laws of nature is no longer actively engaged in its existence and the changes it is going through), and occasionalism (causation of creatures is not real but is merely an occasion for God to act). Creatures exercise causal action that

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<sup>45</sup> See *ST I*, q. 104 a. 2 sed contra: “God gives being by means of certain intermediate causes,” so too God “keeps things in being by means of certain causes.”

is real and proper to their dispositions. Their agency, however, has the character of secondary causation in educing forms from the potentiality of primary matter and coming into existence of new contingent entities. Considering the essence and existence as such of these novel beings, other creatures can only be regarded as their instrumental causes, which emphasizes the depth of the involvement and causal activity of God as the primary and principal cause of creation.

Consequently, our analysis shows there is no opposition between the two already mentioned texts in Thomas' *Summa Theologiae* and *Summa Contra Gentiles*, the first stating "it is impossible for any creature to create, either by its own power or instrumentally—that is, ministerially" (*ST* I, q. 45, a. 5, co.), and the second asserting that "being is the proper product of the primary agent, that is, of God; and all things that give being do so because they act by God's power" (*SCG* III, 66, no. 4). In order to understand that they do not contradict each other, it suffices to realize that secondary agents (acting in the immanent causal order) can cause the eduction of a suitable substantial form from the potentiality of primary matter and the coming into existence of a new contingent entity (*causa fiendi*) but are never causes of its *essentia* and *esse* as such (*causa essendi*). The principal cause of creation of essence and existence of new entities is God. Even if other creatures can be regarded as instrumental causes of their essence and existence, they are not, strictly speaking, causing them. Their agency is simply providing suitable conditions for the instantiation of new entities of a given type (*i.e.*, characterized by a particular essence and its proportionate act of existence).

## VIII. Concurrence of Divine and Natural Causes in an Evolutionary Transformation

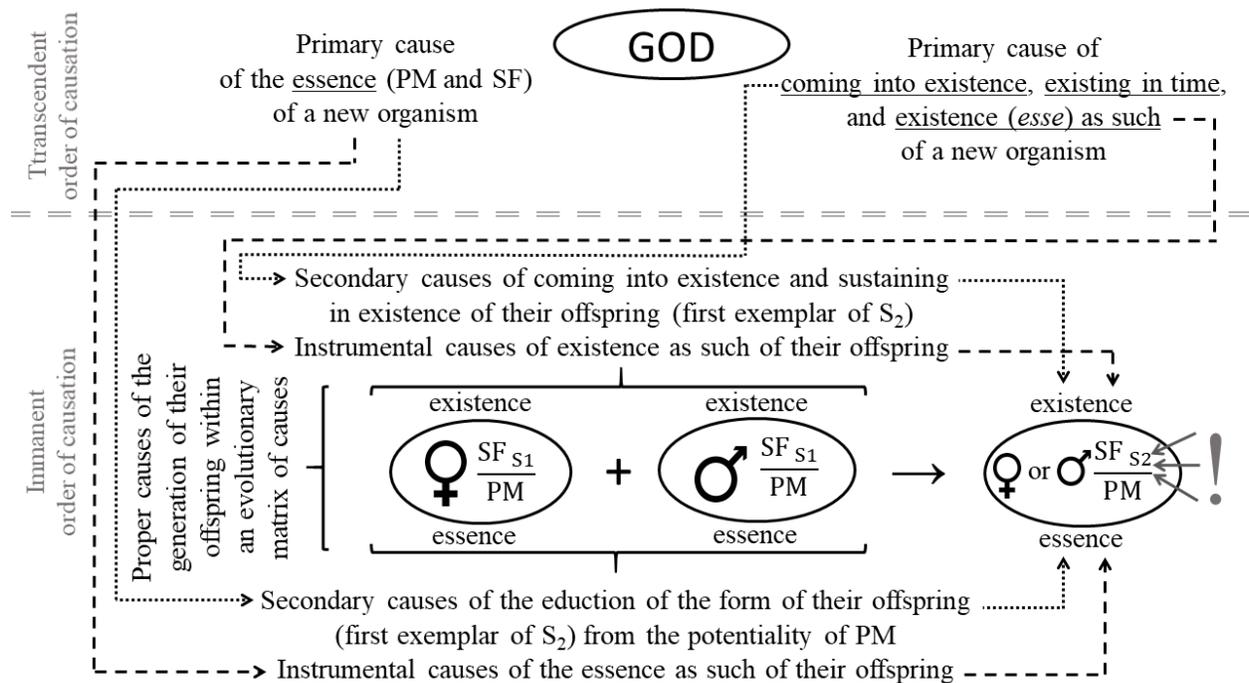
The description of causal relationships at the immanent and the transcendent levels of causation in begetting offspring turns our attention to a special case of such occurrence, a begetting by parents belonging to the species  $S_1$  of the first exemplar of a new species  $S_2$  (*i.e.*, coming to be of a new species in an evolutionary transformation).<sup>46</sup> The exact moment of the eduction of substantial form of a new species is an outcome of an extremely complex process that is extended in time and causally polygenic.<sup>47</sup> It involves: spontaneous chance mutations (affecting genes, chromosomes or

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<sup>46</sup> Aristotelian and Thomistic metaphysics and ontology provide a theory of discrete species. We have already said above in note 26 that the continuity of evolutionary changes does not necessarily disprove this theory. It merely helps us understand how difficult, if not impossible, might be an observation of the exact moment of an evolutionary transition from  $S_1$  to  $S_2$ .

<sup>47</sup> The idea of causal polygeny of events was introduced in analytic philosophy of biology by John Dupré, who in turn takes it from genetics, which acknowledges that many genes typically contribute to the production of

entire genomes), genetic recombination, gene transfer, and genetic drift, which bring changes in genotype and phenotype of organisms that strive to survive and produce fertile offspring (natural teleology). Contribution of these changes to the benefit of the organism is verified by the mechanism of natural selection. All these factors, taken as a whole, can be regarded as proper causes (or one unified cause) of the first exemplar of a new species  $S_2$  in the immanent order of causation. Looking at this process from the perspective of the transcendent order of causation, we can define and make a distinction between secondary and instrumental causes of the origin of the prototype of a new species  $S_2$  (see **fig. 3**).



SF = substantial form

PM = primary matter

$S_1 S_2$  = species 1 and 2

--> Principal causation of God working through instrumental causation of creatures

----> Primary causation of God working through secondary causation of creatures

**Figure 3.** Concurrence of divine and natural causes in an evolutionary transition

one trait. Following Dupré, George Molnar 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. See John Dupré, *The Disorder of Things: Metaphysical Foundations of the Disunity of Science* (Cambridge, Mass: Harvard University Press, 1993), 123-24; George Molnar, *Powers: A Study in Metaphysics*, edited by Stephen Mumford (New York: Oxford University Press, 2003), 195.

If the explanation presented here is correct, then—as in the case of an ordinary begetting of an offspring belonging to the same species—our causal description of the instantiation of the first representative of the new species  $S_2$  allows us to distinguish and name:

1. Proper cause of its origin in the immanent order of causation (in a most basic and pre-philosophical causal explanation), *i.e.*, its parental organisms, within the complex system of immanent causes, involved in the polygenic causal origin of an evolutionary change leading to the coming-to-be of the first exemplar of the species  $S_2$ .
2. Secondary cause of the eduction of its proper substantial form from the potentiality of primary matter, *i.e.*, parental organisms, within the complex system of immanent causes, involved in the polygenic process of instantiation of the first exemplar of the substantial form of the new species  $S_2$  in a given “portion” of a signate mater, which is its principle of individuation.
3. Instrumental cause of its essence (*essentia*) as such, *i.e.*, 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  $S_2$  (actualization of primary matter by a new kind of substantial form of the species  $S_2$ ).
4. Secondary cause of its coming into existence (*esse*), *i.e.*, the operation of efficient causes (parental organisms acting within the evolutionary matrix of causes), which is accompanied or followed by coming into being (*esse*) of their offspring that happens to be the first exemplar of the new species  $S_2$ .
5. Instrumental cause of its existence (*esse*) as such, *i.e.*, 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  $S_2$ , which has *esse* bestowed on it by God.

In other words, similar to the begetting of a new exemplar of the same species, parental organisms of the species  $S_1$ , analyzed within the polygenic causal matrix of an evolutionary transition, can be regarded as proper causes of the prototype organism of the species  $S_2$  within the immanent order of causation. The same causal agency 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 and principal cause of the essence and existence of every contingent being.

What seems to be crucial in this description is the distinction between secondary and instrumental causes. Even if it belongs to the natural dispositions of the parental organisms of the first exemplar of a new species  $S_2$  to be secondary causes of the eduction of the substantial form of

the prototype of  $S_2$  from the potentiality of the primary matter (*essentia*) and of its coming into existence (*esse*)—their action in this process is proper to their natures—when it comes to the essence (*essentia*) and existence (*esse*) as such of the first organism of  $S_2$ , the parental organisms can only be their instrumental causes—“giving” something they in fact themselves cannot offer. The first (with respect to secondary causes) and the principal (with respect to instrumental causes) agent in an instantiation of the prototype of  $S_2$  is God.

One might think this brings our description close to occasionalism, as it may seem that with respect to the essence (*essentia*) and existence (*esse*) of the first exemplar of  $S_2$ , the instrumental causation of its parents (within the evolutionary matrix of causes) provides merely an occasion for God to instantiate them. We must not forget, however, that the instrumental causation in question—which we can verify both within the methodology of science and the philosophical inquiry concerning causal dependencies in nature—is real and irreducible solely to the sort of divine action that a merely empirical inquiry might mistake for actions of creatures. This type of divine agency seems closest to a direct divine intervention in the natural order of created world. Yet, it is neither miraculous nor occasionalist, since it is exercised in and through creatures, “giving” something they, in fact, do not themselves have to offer. This shows the depth of the involvement and the nature of the causal activity of God as the primary and principal cause of creation, and it effectively protects our analysis and explanation from falling into the pitfall of deism.<sup>48</sup>

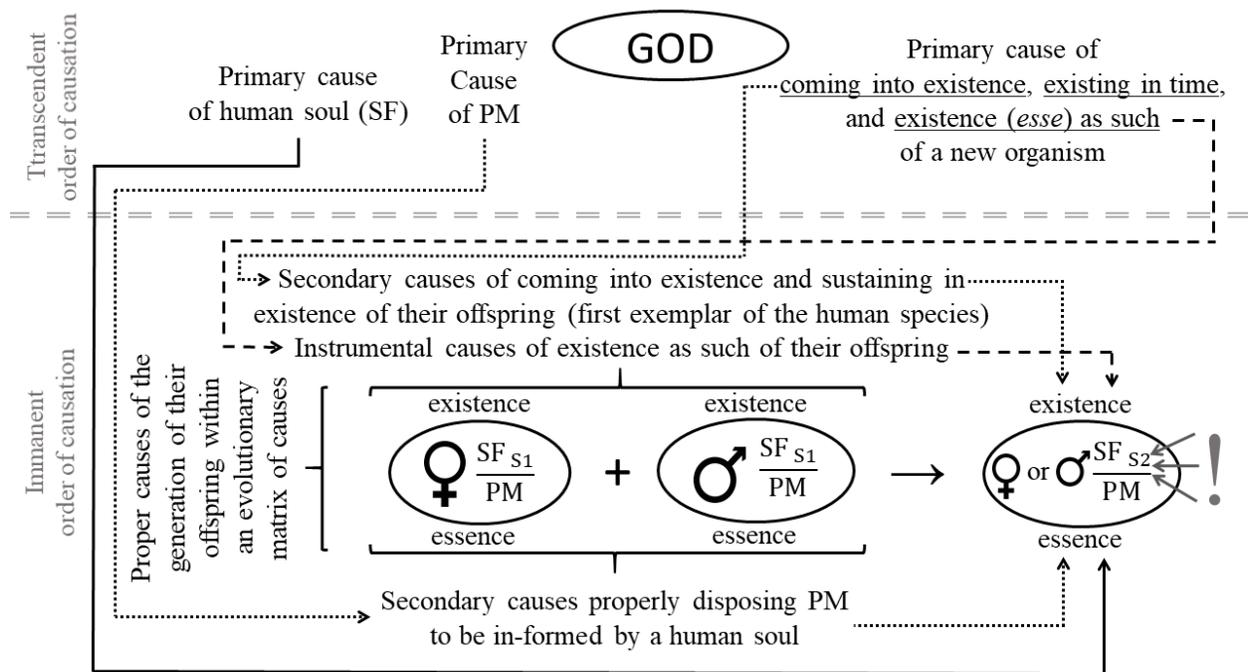
The case of divine concurrence with natural causes in the evolution of man looks considerably different, according to the model presented here. We need to remember that for Aquinas God creates a new human soul (substantial form of a human being) *ex nihilo* at the moment when a new human being begins to exist.<sup>49</sup> Thus, each human soul is not educed from the potentiality of primary matter, as are substantial forms of all other natural beings. It is directly created by God. Parental organisms (together with other agents in an evolutionary matrix of causes)

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<sup>48</sup> As we have already mentioned above (see note 37), Aquinas’s causal description of substantial changes also includes causation of separate substances (angels) and celestial bodies (the sun and the stars). If we want to follow his thought in all details, we should list these agents among other secondary and instrumental causes entering a complex causal nexus, responsible for an evolutionary transition. It is important to remember, in this context, that the ancient and medieval idea of causation of celestial bodies is not just a relic of an outdated cosmology. It is not entirely implausible to see the energy emitted by the sun, forces of gravitation, and other universal cosmological causal principles as contributing to educating particular forms from primary matter in processes of substantial changes occurring in nature.

<sup>49</sup> Note that—following the state of the biological knowledge of his time—Aquinas accepted the idea of the succession of vegetative, plant, and human souls in the embryological development of a human being (see *SCG* III, 22). Nonetheless, his belief in God’s creating *ex nihilo* human soul at the very moment in which a new human person begins to exist, proves to be compatible with contemporary embryology as well.

properly dispose primary matter to receive it. Consequently, although they can be still regarded as secondary causes of the coming into existence, as well as instrumental causes of the existence (*esse*) as such of the first human being, when it comes to his/her essence (*essentia*) they can only be called secondary causes of the proper disposition of primary matter to be actualized by a human soul, which is not educed from the potentiality of primary matter but is directly created by God. This refers to each subsequent begetting of a new human person. The direct divine action of God in creation of human souls is not miraculous, however, as it belongs to the natural order of the universe he created that human souls are not educed from the potentiality of primary matter but created by God *ex nihilo*. Hence, the variation of our model of causation in evolution of man will look as depicted in **figure 4**.



SF = substantial form

PM = primary matter

S<sub>1</sub> S<sub>2</sub> = species 1 (humanoid) and 2 (human)

—→ Primary causation of God (direct intervention)

- - → Principal causation of God working through instrumental causation of creatures

- · - · → Primary causation of God working through secondary causation of creatures

**Figure 4.** Concurrence of divine and natural causes in the evolution of man

Note that we carefully avoid a claim which is popular among many theistic evolutionists who say that the creation of the human body came through the processes of evolution, while the first human soul was directly created by God. This statement is not entirely correct in the context of the Aristotelian-Thomistic thought, which emphasizes that, metaphysically speaking, the proper correlate of substantial form is always primary matter (and not secondary—*i.e.*, already informed—matter). Hence our claim that evolutionary processes properly disposed primary matter to be informed (actualized) by the first human soul (directly created by God *ex nihilo*). This fact becomes apparent in reference to an important passage from Aquinas’s commentary on Aristotle’s *De anima*:

We must not think, therefore, of the soul and body as though the body had its own form making it a body, to which a soul is superadded, making it a living body; but rather that the body gets both its being and its life from the soul. This is not to deny, however, that bodily being as such is, in its imperfection, material with respect to life. Therefore, when life departs the body is not left specifically the same; the eyes and flesh of a dead man, as is shown in the *Metaphysics*, Book VII, are only improperly called eyes and flesh. When the soul leaves the body another substantial form takes its place; for a passing-away always involves a concomitant coming-to-be (*In De an.* II, lect. 1 [§ 225-226]).

The first scholar who proposed a proper interpretation of evolutionary theory within the Aristotelian-Thomistic system of philosophy and theology was French Dominican Marie-Dalmace Leroy. In his book on evolution we find him saying: “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. ... Thus, the Bible—interpreted by theology—tells us that man’s body cannot be derived from lower nature.”<sup>50</sup>

## IX. Difficulty Concerning Immanent Cause(s) of an Evolutionary Transformation

One of the key questions concerning the explanation and model presented here is related to the complex system of immanent causes, involved in the polygenic causal origin of an evolutionary change. Is it plausible and justified to treat them as a unified causal principle of an evolutionary change? This question sends us to another metaphysical query concerning the

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<sup>50</sup> Marie-Dalmace Leroy, *L’évolution restreinte aux espèces organiques* (Paris: Delhomme et Briguet, 1891), 261, as cited in Mariano Artigas, Thomas F. Glick, and Rafael A. Martínez, *Negotiating Darwin: The Vatican Confronts Evolution, 1877–1902* (Baltimore: JHU Press, 2006), 59.

classical principle of proportionate causation, which states that a higher effect cannot proceed from a lower cause.<sup>51</sup>

Emphasizing the polygenic character of causation at work in evolution, Benedict Ashley says: “The new species is not a ‘greater emerging from the less’, because the amount of information it contains in *integrated* form is no greater than the amount of information present in the historical evolutionary process.”<sup>52</sup> Hence, whatever is present in the effect of evolutionary changes, must be present in its “total” cause rather than in one of the particular causal factors. This assertion seems to offer a fitting answer to the question concerning the conservation of the principle of proportionate causation in evolution. One might question its accuracy, however, based on the claim of the contemporary theorists of information who suggest that its amount actually rises with the evolution of the universe (which does not affect the laws of physics, as long as the nature of information is being understood as immaterial). On the other hand, measurement of information in general becomes a problem, as it tends to frame it within the mechanist view of the universe. Thus, it might be better simply to emphasize that ontological categories of “higher” and “lower” are not equal to biological categories of “more” or “less complex,” or “more” or “less effective in occupying an ecological niche.” At the same time, the argument saying that none of the particular “partial” causes in an evolutionary matrix “aims” at an evolutionary change, and that an increase of information is an outcome of a causally polygenic occurrence, seems to offer at least a partial answer to the problem.

But the question concerning the unity of the evolutionary causal matrix remains open. Note that in his explanation Ashley speaks of the “total” cause of an evolutionary transition, which seems to assert a unity to an evolutionary causal nexus. Hence, if such unity is a fact, we might consider introducing an important shift or twist to the causal scenario of evolutionary transitions presented here. If we assume there must be a cause of the unity of the polygenic matrix of causal agents engaged in an evolutionary transformation, we find it difficult, if not impossible, to find it in the

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<sup>51</sup> “[T]he begetter is of the same kind as the begotten” (*Meta.* VII, 8 [1033b 30]). “Effects must needs be proportionate to their causes and principles” (*ST* I-II, q. 63, a. 3, co.). “[W]hatever perfection exists in an effect must be found in the effective cause” (*ST* I, q. 4, a. 2, co.). “[T]he order of causes necessarily corresponds to the order of effects, since effects are commensurate with their causes” (*SCG* II, 15, no. 4). “[N]o effect exceeds its cause” (*ST* II-II, q. 32, a. 4, obj. 1). “[E]very agent produces its like” (*SCG* II, 21, no. 9). “[E]very agent acts according as it is in act” (*SCG* II, 6, no. 4).

<sup>52</sup> Benedict Ashley, “Causality and Evolution,” *The Thomist* 36, (1972), 215. See also Norbert Luyten, “Philosophical Implications of Evolution,” *New Scholasticism* 25 (1951), 300-302; Leo J. Elders, “The Philosophical and Religious Background of Charles Darwin’s Theory of Evolution,” *Doctor Communis* 37 (1984), 56. They both seem to agree with Ashley.

immanent order of causation, where the unity in question seems to be a chance occurrence. This might suggest that God, as the ultimate source of all causality, acting from the transcendent order of causation, brings unity to the evolutionary matrix of causes, causing thus directly the education of substantial form of the first exemplar of a new species from the potentiality of primary matter. All partial causes of this occurrence, including parental organisms, would act as secondary and instrumental causes of this new organism. Their unity, however, would be an outcome of a direct intervention of God in the created order of things.

This scenario might look less attractive for theologians emphasizing “autonomy” of natural causes, as it suggests a direct interventionist divine action in creation of the form of each new species. However, we must acknowledge that it is not entirely implausible and does not exclude secondary and instrumental causation of creatures. One might suggest that God brings an evolutionary change by working through the secondary causation of chance—*i.e.*, the unity of an evolutionary causal matrix occurring by chance—but we must not forget that chance is not a cause *per se*, but only *per accidens*, as says Aristotle: “chance is an incidental cause. But strictly it is not the cause – without qualification – of anything.”<sup>53</sup> This makes the alternative scenario with the direct intervention of God in creation of forms of first exemplars of each new species (lower than human) plausible.<sup>54</sup> Moreover, it also seems to be in line with the abovementioned assertion made by Aquinas in his treatise on the work of six days in which he states that “the corporeal forms that bodies had when first produced came immediately from God, whose bidding alone matter obeys, as its own proper cause.”<sup>55</sup> The immediate dependence of the first exemplar of each new species on God might be explained in terms of the direct divine intervention unifying evolutionary causal nexus of causes engaged in its coming into being.

## X. Conclusion: Theological Advantages and Consequences of the Proposed Model

The proposed model of understanding divine concurrence with natural causes in evolutionary transitions has important theological advantages consequences. First of all, it protects us from the fallacies of both deism and occasionalism. It does not see God as leaving the universe entirely to its own causal operations after creating it, which would suggest that the origin of new

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<sup>53</sup> *Phys.* II, 5 (197a, 12-14).

<sup>54</sup> Our formulation of such scenario is partly inspired by a conversation on philosophical aspects of evolution during the session organized in the Spring of 2017 in Providence College, RI, USA.

<sup>55</sup> *ST* I, q. 65, a. 4, co.

species is an autonomous mundane process with no need of God's involvement at any stage of its realization. Neither does it claim that God does everything, which would put into question the causal autonomy of creatures engaged in complex causal processes of evolutionary transitions.

Moreover, although we have suggested that God works in evolution through secondary and instrumental causation of his creatures rather than through his direct divine intervention, the latter (instrumental) type of causation puts an emphasis on the depth of God's involvement in evolutionary transitions. It reminds us that when it comes to the essence (*essentia*) and existence (*esse*) as such of the first exemplar of a new species (as well as all subsequent organisms of the same species) God is their principal cause, as it is beyond the capacity of contingent entities to be the source of essence and existence as such of any other created beings. What is more, God's involvement and concurrence with creatures in evolutionary processes goes even further with the origin of man. Divine creation of the human soul at the moment of coming into being of the first and all subsequent human beings becomes a direct divine intervention, concurrent with the causality of creatures contributing to the evolutionary nexus of causes that properly dispose primary matter to be actualized (in-formed) by a human soul. One might go even further and embrace the alternative explanation, which—necessitating an identification of the cause of unity of the evolutionary causal matrix—suggests that it is God who brings it about, through his direct causal agency at the origin of the first exemplar of each new species. Although we are more inclined to follow Ashley's emphasis on the polygenic character of causation at work in evolution without the requirement of specifying a separate cause of the unity of causes involved in evolutionary transformations, we find the alternative scenario presented here reasonable.

The proposed model has another advantage in distinguishing between primary and principal causation of God, and secondary and instrumental causality of animate and inanimate creatures involved in evolution, and in specifying the exact nature of those causes within the framework of the transcendent and immanent orders of causation. Moreover, our main purpose was to explain the character of divine and creaturely agency in evolution within the context of the Aristotelian-Thomistic metaphysics and theology, which gave origin to the distinctions both between primary and secondary, and between principal and instrumental types of causes. At the same time, we hope our analysis will prove helpful for other proponents of theistic evolution who make reference to secondary causation in their explanation of evolutionary changes. We hope our research presented here will thus contribute to the ongoing conversation on divine action in various types of transformism (physical, chemical, biological, social, etc.).

Finally, the proposed model of divine action in evolution introduces an important revision and refinement of Aquinas's view of creation. (1) It puts an emphasis on the fact that the initial act of creation is restricted to the *creatio ex nihilo* of the most basic physical matter of the elements. (2) It clarifies the distinction and relation between *creatio ex nihilo* and generation. (3) It perceives 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. (4) It 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. (5) It 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. (6) It does not require a direct divine intervention in the origin of a new plant or animal species (except for the human species) or reinterprets the nature of such an intervention as bringing unity to the causally polygenic and extended-in-time processes of an evolutionary transition. We find these clarifications and changes legitimate within the Aristotelian-Thomistic system of philosophy and theology, which proves its flexibility and relevance within the context of contemporary science.

### Acknowledgements:

I would like to thank the reviewers and editors of the article for the ACPQ for all substantive and linguistic comments and suggestions. Many thanks to Michael Dodds, O.P., and Krzysztof Ośko, O.P. for their valuable insights and intuitions shared at the early stages of my reflection on the topics covered in this article. I also found helpful comments and questions received from the audience of the public presentation of the core ideas of this paper at the Francisco Ayala Center for Theology and the Natural Sciences in Berkeley, CA, in April of 2017.

## Abbreviations

### Abbreviations for the works of Aristotle

<i>De part.</i>	<i>De partibus animalium (On the Parts of Animals)</i>
<i>Meta.</i>	<i>Metaphysica (The Metaphysics)</i>
<i>Phys.</i>	<i>Physica (The Physics)</i>

### Abbreviations for the works of St. Thomas Aquinas

<i>In De an.</i>	<i>In Aristotelis librum De anima commentarium</i>
<i>In Meta.</i>	<i>In Metaphysicam Aristotelis commentaria</i>
<i>In Phys.</i>	<i>In octo libros Physicorum Aristotelis expositio</i>
<i>In Sent.</i>	<i>Scriptum super libros Sententiarum</i>
<i>Q. de pot.</i>	<i>Quaestiones disputatae de potentia</i>
<i>Q. de ver.</i>	<i>Quaestiones disputatae de veritate</i>
<i>Quod.</i>	<i>Quaestiones quodlibetales</i>
<i>SCG</i>	<i>Summa contra gentiles</i>
<i>ST</i>	<i>Summa theologiae</i>
<i>Super de causis</i>	<i>Super librum De causis expositio</i>