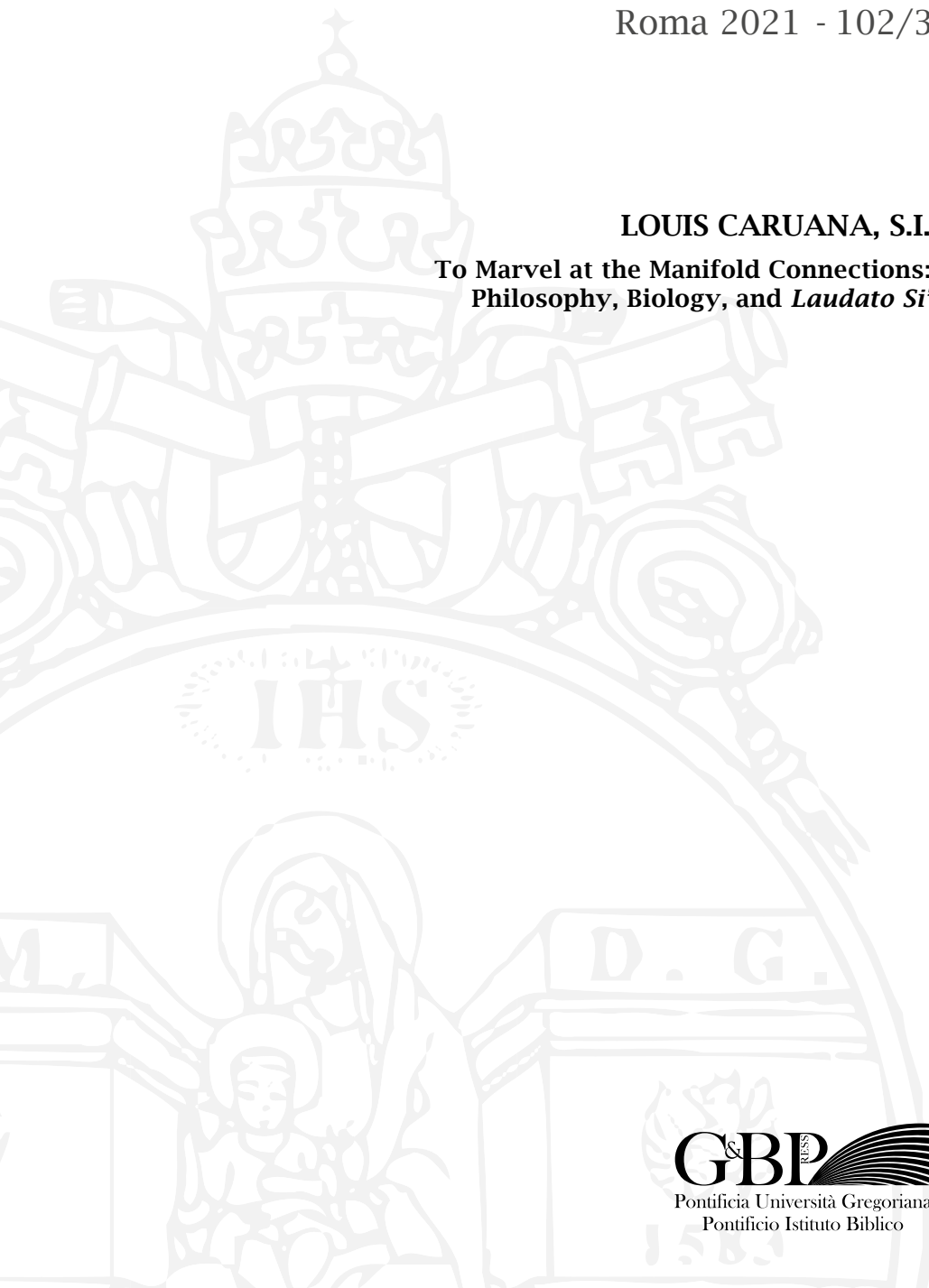


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To Marvel at the Manifold Connections:
Philosophy, Biology, and *Laudato Si'*



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Can we become better at recognizing beauty within the biological realm? Are there new dimensions of beauty available to us today because of recent advances in biological knowledge? Aristotle in his *Metaphysics* assumes that beauty can take various forms: “The chief forms of beauty are order and symmetry and definiteness, which the mathematical sciences demonstrate in a special degree”.¹ He gives priority to mathematics, something that would have pleased his master Plato. For both philosophers, the contemplation of beauty is at its height when we deal with abstract thought. Does this mean, however, that we can neglect the appreciation of beauty that lies within concrete particulars, especially living creatures? For Aristotle, the answer is no. He describes the relative importance between seeing beauty via the abstract and viewing it via the concrete in a famous paragraph of Book 1 of *Parts of Animals*. He explains how, even though our soul resonates better with what is abstract, recognizing beauty in the most modest of organisms is possible and valuable.² The celestial bodies are ungenerated, imperishable and eternal. The sensible evidence we have about them is meagre. Nevertheless, the little we know about them gives us great satisfaction. This satisfaction is similar to our joy when seeing our loved ones, even for a moment. He reminds us how “half a glimpse of persons that we love is more delightful than a leisurely view of other things”. The beauty we appreciate in celestial bodies however should not make us neglect earthly bodies. Knowledge about these is abundant because they are all around us. Of course, at first sight, some animals are not attractive at all. They have “no grace to charm the sense”. Yet every animal is a door through which beauty can shine forth, if only we have enough patience to look. Aristotle underscores this point by associating beauty with the entire range of the natural.

¹ ARISTOTLE, *Metaphysica*, 1078b1, 893.

² ARISTOTLE, *De partibus animalium*, Bk I, chapter 5, 644b22 – 645a26, 656-657.

We therefore must not recoil with childish aversion from the examination of the humbler animals. Every realm of nature is marvelous [...] we should venture on the study of every kind of animal without distaste: for each and all will reveal to us something natural and something beautiful. Absence of haphazard and conduciveness of everything to an end are to be found in Nature's works in the highest degree, and the resultant end of her generations and combinations is a form of the beautiful.³

We have here an invitation to learn how to appreciate the beauty of life, and how to "marvel at the manifold connections existing among creatures".⁴ Since Aristotle, many philosophers through the centuries have discussed the internal harmony of living creatures, the harmony between the structure and function of the organism's parts, combined together efficiently to form an enduring whole. Although this long debate is undoubtedly very rich and deserves careful study, it has at least two shortcomings. First, as the mechanistic and Darwinian worldviews came to dominate the scientific and philosophical landscape, the appreciation of beauty inherent within living creatures tended to fade away. Advances in molecular genetics did not help to resolve this issue but gave support to those who wanted to account for life exhaustively in terms of microstructures. Secondly, we see that, as regards the locus of life, the emphasis has been primarily upon the organism itself, indeed upon its molecular structure, with only a peripheral interest in the environment that supports that organism.

In this paper, my aim is to set the record straight, as it were, by showing that this approach in our understanding of life may indeed have been the most prominent during the twentieth century; it was not, however, the only approach. We find also a somewhat neglected line of argument that explores new dimensions of the organic and refuses to reduce the nature of life to microstructures. As I will show, this second approach avoids the two shortcomings mentioned above and exposes new horizons for the contemplation of beauty, this time not only the beauty lying within the individual organism but also the beauty that is accessible when we see the organism in relation with its environment. To situate my argument, I will first briefly expose Aquinas's view on beauty, a view that he develops in line with Aristotelian ideas. I will then fast-forward, as it were, to the twentieth century and describe the non-reductive line of argument mentioned above. My description will refer to three approaches, each one building on its predecessor. The overall aim is to unveil some new dimensions of natural beauty available to us today because of recent advances in the understanding of life.

³ ARISTOTLE, *De partibus animalium*, 645a15-26, 657.

⁴ Pope Francis uses this expression in the encyclical *Laudato Si'*, paragraph 240.

I. CRITERIA OF BEAUTY

As regards the nature of beauty, the broadly Aristotelian-Thomistic approach I am adopting involves the following fundamental starting points. First, that beauty has a realist, ontological foundation. It lies within the object that we perceive and not just in the eye of the beholder. Consequently, our judgement regarding beauty can be right or wrong in an objective sense. Secondly, that recognizing and appreciating beauty is a skill. Some may be good at it, others not so good. There could be aspects of beauty that we have not yet learnt how to recognize. Aquinas referred to beauty in many of his works, but he consistently makes use of three criteria. “Beauty must include three qualities: integrity or completeness—since things that lack something are thereby ugly; right proportion or harmony; and brightness – we call things bright in colour beautiful.”⁵ These criteria are general, but Aquinas certainly included in his mind the integrity, proportion and clarity we find in living creatures. For instance, when he explains how beauty is an attribute shared by both God and creatures, he writes,

Our experience of order is also instructive here. For we never find many things issuing from one without any sequence among them, save among things differing merely materially, with no particular order among them. However, among things produced that are not just numerically distinct, there is always some order. That is even the reason why order in creation declares the splendor of divine wisdom.⁶

⁵ AQUINAS, *Summa Theologica* I, Q 39, art. 8: “Nam ad pulchritudinem tria requiruntur. Primo quidem, integritas sive perfectio, quae enim diminuta sunt, hoc ipso turpia sunt. Et debita proportio sive consonantia. Et iterum claritas, unde quae habent colorem nitidum, pulchra esse dicuntur.” Notice how, for Aristotle and Aquinas, these criteria allow us to recognize beauty within both natural things and artificial works of art. According to other approaches, like that of G.W.F. Hegel, we can recognize beauty primarily in works of art. Here, the beauty of art is, as it were, the beauty of spirit added onto the beauty of nature: “the beauty of art is born of the spirit and born again” (HEGEL, *Aesthetics*, 2). A fuller treatment of the question regarding beauty and life would need to include Immanuel Kant’s discussion of beauty and the natural, in his *Critique of Judgement*. The link Kant apparently draws between beauty and finality is not completely clear. For most interpreters, he associates beauty with lawfulness of the contingent as such, making aesthetic judgements correlated with teleological judgements. He distinguishes however between the beautiful and the sublime. The latter corresponds to a feeling of how our power of reason goes beyond nature and is thereby superior to the sensible (see for instance “Of Nature regarded as Might” in I. KANT, *Critique of Judgement*, §28).

⁶ AQUINAS, *Summa Theologica* I, Q 36, art. 2: “Ipse etiam ordo rerum hoc docet. Nusquam enim hoc invenimus, quod ab uno procedant plura absque ordine, nisi in illis solum quae materialiter differunt; sicut unus faber producit multos cultellos materialiter ab invicem distinctos, nullum ordinem habentes ad invicem. Sed in rebus in quibus non est sola materialis distinctio, semper invenitur in multitudine productorum aliquis ordo. Unde etiam in ordine creaturarum productarum, decor divinae sapientiae manifestatur.” See also A.A. MAURER, *About beauty*.

For this paper, the most relevant criteria are the first and the second. The first one, integrity, refers to the way the thing is well distinct from its background and is a good exemplar of its kind. Integrity is manifested when the thing acts as one. In this sense, it is most evident in living creatures. The second criterion, proportion or consonance in the sense of musical harmony, refers to the way the parts are well incorporated within the whole. This applies not only to the parts that are easily visible but also to intricate parts that are visible only through prolonged research, for instance at the microscopic level. Again, this second criteria is most evident in living creatures. Advances in biological knowledge have confirmed the beauty of living creatures in this sense. Even Charles Darwin, with his arguments against the idea of eternally fixed biological kinds, mentions the beauty of life in the concluding paragraphs of his *The Origin of Species*. He invites the reader to admire the beauty of life, as he says, “endless forms most beautiful and most wonderful”, resulting from the interdependence of organisms in the course of the long process of evolution and speciation.⁷ After Darwin however, the rise of molecular genetics rekindled the hope of arriving at a complete explanation of life by seeking the microstructure of the organism, conceived of as a kind of information nano-machine.⁸ As a counterbalance to this trend, my proposal is therefore to recover the idea of admiring beauty not only in terms of the harmony evident within the organism’s microstructure but also in terms of the harmony between the organism and its environment, between the organism and the “containing space” that makes it possible. To do this, I will consider three approaches that focus primarily on the role of the environment. They offer new insights about life and its beauty by focusing on how life as such is not a phenomenon attributable to the organism on its own but to the organism together with its environment. Togetherness is the main point.

II. THE FIRST APPROACH: JAKOB VON UEXKÜLL

The first approach is associated with Jakob von Uexküll, a biologist who had a decisive influence on a number of key twentieth century thinkers like Martin Heidegger and Gilles Deleuze. For our concerns, his most relevant works are the book *A foray into the world of animals and humans* (1934) and

⁷ “There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been and are being evolved.” C. DARWIN, *The Origin of Species*, 396.

⁸ A typical example is E. SCHRÖDINGER, *What is life?*, which was first published 1944.

his paper “A theory of meaning”.⁹ While Darwin and his successors adopted a diachronic approach, focused on the history of the species, Uexküll sought to uncover the synchronic features of the phenomenon of life in its various forms and interrelations.

His keywords are *Umwelt* and subject. “*Umwelt*” means surrounding-world, environment, or milieu. Animals have different ways of perceiving. What a specific organism can perceive determines that organism’s world. Since we can observe organisms that have a very limited set of perception-determinants, for instance simple insects, we can build some idea of what their world is like. To each animal, its own *Umwelt* – and this holds also for us humans. Uexküll’s idea of subject relates directly to this. For him, even the simplest, primordial kind of sentience is perception. Every life form therefore is a subject. The organism’s ways of registering the surroundings, as it perceives and as it thereby constitutes its *Umwelt*, are brought together into a single project. The fact that the organism survives through time shows that it and its *Umwelt* are well tuned to each other. A simple organism is well tuned to its simple *Umwelt*, a complex organism to its complex *Umwelt*. “Subject and object are interconnected with each other and form an orderly whole. [...] All animal subjects, from the simplest to the most complex, are inserted into their environments to the same degree of perfection. The simple animal has a simple environment; the multiform animal has an environment just as richly articulated as it is [i.e. as the animal is].”¹⁰ Notice how, for Uexküll, we should not visualize the organism as choosing some features of the world while neglecting others. From its viewpoint, there is no choosing. For any given organism, there are no features of the world except those that it can perceive. Moreover, those features it can perceive are the determinants for its existence. In other words, they are features that correspond to, and in a sense constitute, the very nature of that organism. “Every subject spins out, like the spider’s threads, its relations to certain qualities of things and weaves them into a solid web, which carries its existence.”¹¹

Uexküll continues to elaborate the idea of harmony in his paper “A theory of meaning”, where he resorts to the analogy of music. Life is a matter of “being in tune with”. Rather than limiting our attention to the microstructure of living things, assuming that the essence of life is somewhat encapsulated within DNA, we should explore also other levels of the phenomenon.¹² To

⁹ First published in Germany in 1934. This English edition includes the paper “A theory of meaning”. Throughout this book, Uexküll justifies his arguments by many interesting biological observations.

¹⁰ J. VON UEXKÜLL, *A Foray*, 49-50.

¹¹ J. VON UEXKÜLL, *A Foray*, 53.

¹² The position I am worried about here is well represented by the so-called Modern Synthesis, which, for many decades, defended the view that the germ line cells within the organism are

appreciate these other levels we may require new vocabulary. Consider for example how Uexküll explains the relation between the spider and the fly. “The spider’s web is configured in a fly-like way, because the spider is also fly-like. To be fly-like means that the spider has taken up certain elements of the fly in its constitution.”¹³ To refer to the relevance that a fly has as regards the spider’s nature, Uexküll uses the familiar term “meaning”. The fly has meaning for the spider. He thus sees nature in its entirety, including both organisms and their inorganic environments, as a set of relations of meaning.

For professional philosophers well versed in semantics and philosophy of language, this free use of the term “meaning” may seem somewhat simplistic. Uexküll’s main point however is not so distant from the now prevailing theory of meaning, namely the theory of meaning as use. On Ludwig Wittgenstein’s view, “use” refers to what humans do with the sounds they produce. Uexküll extends this idea to involve not only human users but also all other living things, seen as users. For him, in fact, the idea of life is intimately connected to the idea of meaning and we identify life through the idea of use. He illustrates this by observing how the wind relates to two different objects: clouds and maple keys.¹⁴ For clouds, the wind is just the cause of their form and movement. For maple keys however the wind is not just a cause. The wind is used. The maple key form is adjusted for the wind. For maple keys, the wind is not merely “the cause of the development of form, as with clouds, but rather, the forms are adjusted to the meaning factor ‘wind’, which they utilize”.¹⁵ The point here is not that maple keys have a plan and use the wind intentionally. Nor is it that an evolutionary explanation is impossible or inadequate. The point is rather that,

isolated from the rest of the organism. Any changes, therefore, at levels higher than the molecular level have no effect on the offspring. Ernst Mayr, a prominent exponent, explained this as follows. “All of the directions, controls and constraints of the developmental machinery are laid down in the blueprint of the DNA genotype as instructions or potentialities.” See E. MAYR, “The triumph of evolutionary synthesis”, 1262. This fundamental tenet of the Modern Synthesis has now been falsified by various experiments. For a comprehensive overview, see D. NOBLE, *Dance to the tune of life*.

¹³ J. VON UEXKÜLL, *Foray*, 190.

¹⁴ Maple keys are maple seeds attached to a kind of wing that rotates as it drops, carrying the seed across a considerable distance before it hits the ground.

¹⁵ J. VON UEXKÜLL, *Foray*, 151. This idea of use is also evident in the way organisms differ from machines. To articulate his point, Canguilhem uses the distinction between centripetal and centrifugal processes. Processes of the former kind of process start from the environment and move inwards towards a center, while processes of the latter kind start from the center and move outwards. We construct machines centripetally because we gather different components and put them all together into one functioning whole. Organisms however are different. Biological evidence shows that organisms take shape and form via a centrifugal process. Slight changes in the embryo will be readjusted, or cancelled, so as to produce, always, or nearly always, the same result.

whatever we could say regarding the origin of such a phenomenon, we need to recognize how life is, in a sense, a matter of one thing “using” another.¹⁶

Where is beauty in all this? Uexküll’s approach could entice our imagination to contemplate eerie scenarios regarding our human position within the universe. For instance, we humans, even though we think we are mapping the material universe reasonably well, could in fact be as limited in our perception and cognitive outreach as a small insect is with respect to its modest world. As far as we know, we could be just parts of a huge organism that we cannot perceive. Such a superorganism would be beyond us as much as the human body is beyond the perceptual reach of the humble bacteria that live within it. Such fantasy trips of the imagination do not lead anywhere – by definition. They reflect indeed logical possibilities but could perhaps be helpful only in so far as they generate within us an attitude of modesty and humility as we contemplate the universe. The correct way forward, put simply, is to acknowledge that we do not know everything. Uexküll’s work invites us to remain open to the beauty of life’s intricate fabric of interrelations that range from the extremely small to the extremely large. Excessive interest in micro-explanations may have eclipsed this kind of beauty. Of course, there is beauty in DNA’s double helical structure, and in other fascinating micro-processes within organisms. Here however, we are talking about another kind of beauty, the kind that is available when we see the organism as a whole in harmony with its *Umwelt*. Instead of zooming in towards the microstructure, this approach invites us to zoom out. It invites us to contemplate how the organism is situated within its environment, which itself contains organisms situated within their environments, and so on. The network becomes extremely complex, resembling a neural network.

III. THE SECOND APPROACH: GEORGES CANGUILHEM

Like Uexküll, Georges Canguilhem was a seminal thinker whose innovative thinking influenced various important philosophers, in his case, people like Jacques Derrida and Michel Foucault. For our concerns, his most important book is *La connaissance de la vie* (1952), especially the chapters “*Machine et organisme*” and “*Le vivant et son milieu*”. Here we find an original exploration of the very idea of environment with reference not only to biology but also to technology. For lack of space, I will focus on two points only: on his arguments

¹⁶ Uexküll’s link between the idea of meaning and that of use finds an analogue not only in Ludwig Wittgenstein’s later writings but also in Martin Heidegger’s ideas, especially his study of *Zuhandenheit*. The idea that biology can be explored via the key concept of meaning has given rise to a subdiscipline called biosemiotics. For an overview, see M. BARBIERI, “Biosemiotics”; J. DEELY, “Umwelt”. The entire issue of *Semiotica* 134 (2001) is dedicated to this topic.

against the predominant mechanistic account of life and on the resulting understanding of the environment.

Regarding the first point, he starts by noticing how “the problem of the relation between machine and organism has been studied, in general, in one direction only”.¹⁷ By this he means that we have been trying to understand the organism in terms of the machine and not the other way round. This one-way explanatory strategy assumes that, as regards cosmology in general, the stable position, or the starting point for explanation, is death, not life. Jean-Baptiste Lamarck, for instance, assumed, perhaps unawares, that the inanimate state is the stable configuration of the universe, life being a kind of unstable superstructure. Life is doing all it can to retain its position, to resist being reabsorbed into the chill of death. Canguilhem affirms that, “in Lamarck’s view, life resists only by deforming itself in order to survive”.¹⁸ The organism struggles uphill, as it were, against the deadweight of its environment. Canguilhem wants to reverse this explanatory one-sidedness, and he justifies his move by recalling how machines, in fact, derive from humans. Machines do what humans do. Machines lift, dig, push, pull, move, calculate – the entire realm of technology is anthropomorphic, at least in this sense: “the construction of a mechanical model presupposes an original that is alive”.¹⁹ The machine is part of the human environment. It is an extension of the human. Consequently, we should explain the machine in terms of the organism, not the other way round. To understand the machine, we need to situate it within the historical narrative of humanity, which itself is understandable when situated within the grand narrative of life in general.²⁰ First life, then technology. Although it may sound strange, we are obliged to say that technology, being an extension of life, is a biological phenomenon.

From this perspective, Canguilhem draws some interesting conclusions regarding the environment. First, we cannot take any longer the stable, default position of the universe to be the state of inanimate matter. One cannot assume any longer that life is somewhat like Sisyphus working against the inexorable pull towards death. On the contrary, the environment is not oppressive at all. It is indeed an essential ingredient of life. It makes life possible. It represents the set of essential conditions for the manifestation of the organism’s latent dispositions. Canguilhem expresses the essential collaboration between organism and environment as follows. “To live is to radiate forth; it is to

¹⁷ “Le problème des rapports de la machine e de l’organisme n’a été généralement étudié qu’à sens unique.” G. CANGUILHEM, *La connaissance de la vie*, 124, (my translation).

¹⁸ “Dans la conception de Lamarck la vie résiste uniquement en se déformant pour se survivre.” G. CANGUILHEM, *La connaissance de la vie*, 169.

¹⁹ “La construction d’un modèle mécanique suppose un original vital.” G. CANGUILHEM, *La connaissance de la vie*, 140.

²⁰ G. CANGUILHEM, *La connaissance de la vie*, 150.

organize the environment by departing from a center of reference that cannot itself be referred without losing its original meaning".²¹ In line with Uexküll, Canguilhem is here highlighting the idea that all organisms are subjects in some sense, at least in the sense of being a unifying center for their specific perceptive capacities.²² Evidently, Canguilhem is trying to account for the biological realm in a new way. He is trying to think outside the box, outside the box of prioritizing micro-explanations, outside the box of wanting to explain life exhaustively in terms of DNA. In so doing, he makes new nuances emerge, nuances that could suggest fresh insights and trigger inquiry in new directions. We start seeing that the relations between organism and environment are essential for there to be life. Both the organism and the environment are essential constituents of life. In our consideration, we often prefer focusing on the organism, but we should recall that life emerges only when that organism functions as one with its environment. Of course, at times the environment can be destructive, wiping out life without mercy. That only shows however the importance of the harmony between organism and environment as a condition for life. This is similar to the way cyclists become one with their bicycle as they ride in various conditions, the bicycle becoming as extension of their sense of touch, their sense of balance, and so on. They become one functioning whole. Seeing the environment in this light, we could say that the unit of life is not the single organism, or the single species, but the entire biosphere. We are invited to admire the beauty that lies in the whole. Just as stepping away from a large painting is essential for appreciating it properly, for appreciating the full harmony between the colored patches, so also with life. Stepping away from the organism to see it within its environment opens up new horizons for the appreciation of natural beauty.

IV. THE THIRD APPROACH: RECENT RESEARCH

The final approach I want to consider deals with recent, and more technical, developments in the area of evolutionary biology in line with Uexküll's and Canguilhem's approaches.²³ Well into the 1970's, the work of these two

²¹ "Vivre c'est rayonner, c'est organiser le milieu à partir d'un centre de référence qui ne peut lui-même être référé sans perdre sa signification originale." G. CANGUILHEM, *La connaissance de la vie*, 184.

²² To see in detail how Uexküll's concept of *Umwelt* relates to Canguilhem's *milieu*, see W. FEUERHAHN, "Du *Milieu* à l'*Umwelt*".

²³ I draw mainly from Richard Lewontin who, apart from his purely scientific work, made some significant philosophical contributions, often together with his colleague Richard Levins. See especially R. LEVINS – R. LEWONTIN, "Dialectics and Reductionism in Ecology"; R. LEWONTIN, "The organism as subject and object of evolution"; R. LEVINS – R. LEWONTIN, *The dialectical biologist*; R. LEWONTIN – R. LEVINS, "Organism and environment".

authors remained marginal and the asymmetrical view regarding organism and environment prevailed. This was probably due to spectacular advances in biochemistry and in molecular genetics and to the unquestioned loyalty that many felt towards the basic features of classical Darwinian explanation. On this classical view, the organism's development occurs because, on the one hand, there are factors internal to the organism, namely traits and dispositions that undergo some random variations from one generation to the next. On the other hand, there are other factors external to the organism, namely environmental determinants that act mainly as filters. On this view, all the attention as regards the nature of life lies upon the organism.

The environment was something like the organism's inert "container", an idea that gave rise to the expression "ecological niche". There are various definitions of this term. In general, we can say that an ecological niche of a species is the set of its environmental necessities, its behaviors, its relations to other species including its enemies, and the overall environmental configuration that permits that species to flourish. In line with the alleged independence of the environment, ecological niches were seen as pre-existing, abstract sets of conditions, or as possible worlds, in the logical sense. They were considered abstract regions of ecological possibility space. In other words, an ecological niche was seen as a kind of house waiting to be occupied by some organism. Advanced work in this area, inspired mainly by Sewall Wright, viewed the ecological possibility space not just as a set of distinct niches but rather as a kind of geometrical landscape with hills and valleys. The hills corresponded to adaptive peaks, which were specific regions towards which natural selection pushes a given species in the course of its evolutionary history. The higher ground of such a landscape corresponds to a maximizing of fitness.

In spite of these interesting theoretical proposals, the underlying attention primarily on the evolving organism started to attract criticism in the mid-1970s from some prominent biologists. Richard Lewontin and Richard Levins expressed their worry by using the image of a theatrical stage: "Darwinism represents the environment as a preexistent element of nature formed by autonomous forces, as a kind of theatrical stage on which the organisms play out their lives".²⁴ The main target of such criticism was the idea of an ecological niche. It needed revision. Evolutionary biologists, especially in the area of genetics and ecology, have now realized that assuming an asymmetrical relation between organism and environment is like seeing half of the picture only. In reality, the biosphere is very complex. There is interaction and change in both directions. The environment shapes the organism, and the organism shapes the environment. Moreover, a reshaped environment favors that organism, but it also affects other organisms. Of course, many have observed, probably

²⁴ R. LEWONTIN – R. LEVINS, "Organism and environment", 96.

since prehistoric times, that predator and prey exist in a balanced bilateral relation that results in stable populations. Very few however have seriously considered a similar mutual relation between the organism and its inanimate environment, for instance the relation between a seed and the soil around it. This is the novelty here. The organism is not just an object that is acted upon by the environment. It is also subject. It acts upon the environment.²⁵ The idea of ecological niche therefore has to be revised accordingly. If we conceive of possibility landscapes as having adaptive peaks, we need to acknowledge that this landscape itself is changing all the time. Rather than seeing it as something solid, we should picture it as analogous to the ocean surface with crests and troughs that are changing all the time. Only in this bold way can we represent the fact that, between organism and environment, there is reciprocal codetermination. Referring to this point, some philosophers speak even of co-evolution between organism and environment.²⁶ This way of speaking, however, seems to be inaccurate because not all kinds of change over time correspond to evolution as understood by biologists. The environment certainly undergoes change, and some of this change is due to the organisms that live within it.²⁷ This kind of change however is not evolution in the biological sense. Co-evolution, strictly speaking, happens when we have reciprocal pressure between two species in which each species imposes selection on the other. For instance, parasites and hosts co-evolve in response to each other. Nevertheless, although it may not be accurate to use the term co-evolution to describe the relation between an organism and its environment, we cannot deny that there is co-determination.

Where does all this leave us as regards our understanding of life in general? We need to start to acknowledge that life is not just “inside” the organism. It is not just a set of dispositions lying within those entities we call organisms. It is rather a vast phenomenon that results from the relation between organisms and their environment. The environment is not just a fixed set of manifestation conditions that enable life, which is allegedly encapsulated within the seed. The environment itself is changing – changing in function of the sprouting seeds. The environment participates in life just like the seed that is waiting to sprout. For a deeper appreciation of biological life therefore, we need to see that, “the seedling is the ‘environment’ of the soil in that the soil undergoes lasting evolutionary changes of great magnitude as a direct consequence of the

²⁵ Notice how, in a strictly biological sense, we reencounter here the idea of life as the presence of a primordial subject, as had been proposed by Uexküll.

²⁶ For instance, “A consequence of the codetermination of the organism and its environment is that they coevolve” (R. LEWONTIN, “Organism and environment”, 98).

²⁷ For instance, early life on Earth generated oxygen within the atmosphere as a waste product. In response, organisms eventually began to use oxygen for respiration.

activity of the plants growing in it, and in turn feeds back on the conditions of existence of the organisms”.²⁸ Life is a category that covers much more than organisms.

V. CONCLUSION

The general aim of this paper was to generate a deeper appreciation of the message of *Laudato Si'* by explaining recent biological and philosophical achievements that allow us “to marvel at the manifold connections existing among creatures”. First, I recalled the basic criteria for beauty, as expressed by Aquinas: clarity, harmony, and integrity. I then exposed three ways in which prominent philosophers of biology during the twentieth century have sought to overcome the limitations of reductionism. The first approach, associated with Uexküll, highlights the idea of organism as the subject of its world, a world that is perfectly in tune with that organism’s use of it. The second approach, associated with Canguilhem, highlights the limitations of the machine-metaphor as a starting point for the understanding of life. Life is better seen as the fruit of collaboration between organism and environment. The third approach, referring to recent research, highlights the need to think of life not as located primarily within an organism that inhabits an ecological niche but as a phenomenon emerging from the reciprocal coordination between organism and environment. Of course, the overall point was not to justify some kind of anti-Darwinian vitalism. It was rather to see more than we usually see. Nearly all the arguments I presented deserve further clarification and justification, and there is much more to explore. Nevertheless, it seems safe to conclude that our knowledge today offers clear support for the following two claims. First, that Aristotle was right in saying that Nature’s works, her generations and combinations, are a form of the beautiful. Secondly, that harmony, proportion, and integrity in the natural order are more evident now than they were before. Recent developments in the philosophy of biology allow us to admire beauty within nature in a new key.

Does this conclusion allow us perhaps to see life as a transcendental attribute of being, on a par with truth, beauty, and goodness? In the Aristotelian-Thomistic tradition, transcendentals are characteristics of all that is. Obviously, if not all beings are alive, then life as a transcendental is ruled out. Nevertheless, if we see the activity, or dynamism, inherent within all things as a proto-trace of self-movement, we could perhaps adopt a broader view of life. We could see life as a transcendental in this sense. Scholastic thinkers differ in fact from defenders of mechanistic thinking precisely on the question of whether matter is inherently active or passive. For the Scholastics, matter is active. All things participate,

²⁸ R. LEVINS – R. LEWONTIN, “Dialectics and Reductionism in Ecology”, 49.

to various degrees, not only in God's being but also in His activity. If this inherent dynamism is accepted as a proto-trace of the kind of self-movement that characterizes organisms, then life could indeed be a transcendental. Such an interpretation would resonate well with the basic framework of the hierarchy of being, the beautiful hierarchy of being, ranging from the primordial activity of elementary particles, which can repel and attract according to their electric charge, to Divine eternity, understood in terms of life: "*interminabilis vitae tota simul et perfecta possessio*".²⁹ In this way, admiring beauty in all that is unfolding would open for us a door to God, the fullness of life.³⁰

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ABSTRACT

One of the aims of *Laudato Si'* is to help us "marvel at the manifold connections existing among creatures", to show how we are also involved, and to motivate us thereby to care for our common home. Are there new dimensions of beauty available to us today because of recent advances in biology? In this paper I seek to answer this question by first recalling the basic criteria for beauty, as expressed by Aristotle and Aquinas, and then evaluating their applicability as regards three ways in which some prominent twentieth century philosophers of biology have sought to overcome the limitations of reductionism. The overall argument refers especially to the works of Jakob von Uexküll and Georges Canguilhem. The results indicate that harmony, proportion, and integrity in the natural order should be more evident than ever before, especially as regards the way the organism and its environment codetermine each other. This insight allows a deeper appreciation of the message of *Laudato Si'*.

Keywords: *Laudato Si'*, Uexküll, Canguilhem, environment, ecology, beauty

RIASSUNTO

Uno degli obiettivi dell'enciclica *Laudato Si'* è di aiutarci "ad ammirare i molteplici legami che esistono tra le creature", di mostrare come noi stessi siamo coinvolti, e motivarci così a prendere cura della nostra casa comune. Alla luce dei progressi

²⁹ "The simultaneous and perfect possession of unending life", BOETHIUS, *De consolatione philosophiae*, Liber 5, part 6, verse 4 (155).

³⁰ I thank John F. Shea and John Braverman for helpful comments on an earlier draft of this paper.

nel campo della biologia, ci sono oggi nuove dimensioni di bellezza nella creazione? Questo articolo cerca di rispondere a questa domanda ricordando dapprima i criteri fondamentali da considerare per riconoscere la bellezza (secondo Aristotele e Tommaso d'Aquino); valuta poi l'applicabilità di questi criteri nell'ambito del lavoro di alcuni filosofi della biologia del ventesimo secolo che hanno lottato per superare le limitazioni del riduzionismo. L'articolo fa riferimento soprattutto alle opere di Jakob von Uexküll e di Georges Canguilhem. Queste analisi indicano che l'armonia, la proporzione, e l'integrità nell'ordine naturale devono essere più evidenti che mai, specialmente in ciò che riguarda il modo in cui l'organismo e il suo ambiente mutualmente si determinano. Questo approfondimento permette dunque un maggior apprezzamento del messaggio della *Laudato Si'*.

Parole chiave: *Laudato Si'*, Uexküll, Canguilhem, ambiente, ecologia, bellezza

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