

Leibniz and “Biology”——A historical and philosophical consideration^{*1}

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Abstract

According to the recent trend of international Leibniz study we explore historical and philosophical topics of life and “biology” such as the issues of mechanical philosophy of animals since Descartes and of the genetics in connection with conceptions of “evolution” at the infancy of biology. Leibniz's view is remarkable not only both for and against the mechanical and atomist philosophy of lives by his attitude for the mechanical explanations of bodies and his “rehabilitation of substantial form” at the same time, but also in his insight to combine of reproduction of lives with “evolution” of a different species in extraordinary time, although his evolutionism is “developmental” in contrast to the genuine Darwinism. However it must be confirmed that through this speculation Leibniz realizes the “temporalization” of the great chain of being or the temporal continuity of all lives including rational animal in his “philosophical biology.”

Keywords: Leibniz, biology, philosophical biology, developmental evolutionism

1 Leibniz after 300 years of *Monadology*

The last universal genius and one of the great Metaphysicians in 17th century, G.W. Leibniz wrote up his “*Monadology*” about 300 years ago. And in recent Leibniz study, here only referring to the seminal works of Duchesneau, *Leibniz le vivant et l'organisme* in 2010 and Justin Smith, *Divine Machine, Leibniz and the Sciences of Life* in 2011, not only this enigmatic piece but also the whole of his philosophy have been reread from the view point of “biology” in rather wider sense, even though the word “biology” for an independent discipline was coined for the first time at the beginning of 19th century^{*2}. And his considerations about the life and living things covers also even some topics of contemporary “philosophy of biology.” In this paper we show the relevance of his thoughts about the life and living things by

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^{*2}Here we use “biology” for empirical and positive sciences of lives including zoology, botany, genetics and medicine in rather wide sense. In 17th century these all were not rigidly specialized.

exploring their historical contexts of both mechanical philosophy since Descartes and of the genetics in connection with the controversial conceptions of “evolution” at the infancy of biology in early modern epoch.

Generally speaking, the recent trend of Leibniz study is motivated at least in part by the rise of bioscience and philosophy of biology in our time. However the philosophical problems of life and the “biology” are as a matter of fact essential and crucial also for the metaphysics of Leibniz who stands in the breakthrough of Cartesian mechanist era long after Aristotle in the antiquity and still before “Darwinian and Non-Darwinian revolution” in the midst of the 19th century. As a starting point of our consideration we shall briefly remind us of Leibniz’s status quo by his well-known historical episodes such as “rehabilitation of substantial form” against the mechanists and atomists of early modern epoch including Cartesian natural philosophy or his admiration at the discovery of spermatozoon of Anton van Leeuwenhoek by newly invented microscope and his deep interests in the debate of genetics about “preformation” versus “education,”^{*3}. At a first glance these all together would be a sort of scientific and philosophical chaos.

After focusing on his unique view both for and against the mechanical philosophy of lives, especially of animals, in the contexts of Leibnizian philosophical biology^{*4} in chapter 2, we enter into the biological problems of reproduction of lives and “evolution” of a different species in the §74 and 75 of *Monadology* and the related texts of *Theodicy* and of his other correspondences in that period in chapter 3 of this paper. By interpreting these texts we will make explicit Leibniz’s metaphysical understanding both of the mechanism of organic bodies and of “something beyond” the mechanical philosophy of lives in his historical contexts, so as to possibly bring out the significance of his philosophical biology for us today. In chapter 4 we will lastly evaluate Leibniz’s philosophical biology by confronting it with an interpretation about Leibniz by “philosophical biology” of Hans Jonas as a case.

2. Leibniz for and against the mechanical philosophy of lives

First, for characterizing our reading of Leibniz’s philosophical biology on the whole, we refer to the recent two representative interpretations above mentioned; from influential understandings of Leibniz’s “biology” such as presented by Duchesneau and Smith, organic bodies of animals are “natural machines”^{*5} that are essentially not different from artificial ones except for their infinity as “divine machines” created

^{*3} Additionally in this context Leibniz discussed about the methodology of medicine with his contemporary Georg. E. Stahl in his critical commentaries of the books of Stahl (Dutens. II. 2.131ff).

^{*4} In contrast to the philosophy of biology as a subdivision of philosophy of science today as it is typically exposed by Sober or Rosenberg, we can and should ultimately characterize our considerations as “philosophical biology” for more speculative type of thinking about the essence of lives or living things.

^{*5} According to Fichant the concept of “natural machine” appeared for the first time in the first draft of so-called *New system* (GIV.471ff. cf.Fichant.2003.1.) in 1695. Leibniz had used it however earlier, for example, in his comments about Cordemoy in 1685 (cf.Matsuda.2014b.) About the relationship of Leibniz and Cordemoy please see more in our note 15.

by God (Smith.2011. 115), where infinitely small parts of organic bodies are also perfectly organized (G VI. 611). In fact, Leibniz himself consistently claims that we can basically explain all phenomena of living things mechanically without any final causes. In addition Leibniz did not yet use “organism” for living things as animals in opposition to mechanism. However, he himself ultimately and obviously appeals such metaphysical notion as “substantial form” and monads which are ontologically not only simple or indivisible, but also constitutive for a whole organic body, for explicating the nature of lives (cf.Passini.93); that notion is categorically distinct from Cartesian geometrical “extension.” This solution against Cartesians may naturally cause an interpretive conflict in the problematic of Leibniz’s philosophical biology itself among Cartesian types of mechanical philosophy, the vitalism of Paracelsus or Stahl and the traditional scholastic Aristotelianism of substantial forms.

In one interpretation, Leibniz appears to be so to speak a “disguised” mechanist with Cartesian spirit who is only metaphysically willing to complement the mechanism of lives, such as in the motions of animal body, the process of nutrition or of the generation in the embryo etc., by theologically adjusted teleology for God’s immensity. Smith suggests this type of interpretation in his “theology of mechanism” in Leibniz (Smith.2014). In other words, according to this view Leibniz pretends to rehabilitate the concepts of substantial forms no other than in a natural theological dimension. And in this regard, “life” proves to be not an ontologically and scientifically primitive concept at all, but the life in this sense would become at most a theological principle that is additionally introduced from outside the scientific explanations of organic bodies. This type of interpretation ultimately invites a sort of “mechanical reductionism” of lives into mere matters or their material processes in Leibniz. Naturally we could not entirely exclude this interpretative option, as it is just the case in his well-known hypothesis of pre-established harmony that presupposes the mind-body ontological dualism without the third primitive or medium such as substantial form, if there would be only minds and bodies in strict metaphysical sense also in Leibniz’s ontology. Nonetheless, we cannot take unconditionally Leibniz for such a “disguised” mechanist at last, as far as we can read that Leibniz repeatedly and enthusiastically discusses in details about the necessities of reintroducing of substantial form as something primitive in the sciences of lives in his correspondences with the representative Cartesian, Arnauld in his time in 1687 (G II .77ff)^{*6}.

In contrast to the first interpretation, Fichant asserts his view against the Cartesian type of mechanical philosophy of lives that organic bodies “result” from innumerable concurrent monads (G II . 252, 268ff).^{*7} According to Fichant Leibniz claims that animal bodies consists of “second matters informed by souls” and that there exist a principle of “unity” or life. This is without doubts a kind of

^{*6}The author discussed fully this problem from the correspondences of Leibniz with Arnauld (Matsuda.2014a, 2015c).

^{*7}cf. Fichant.2003.24. This remarkable constitutional operation of “super-addition” of monads can be further articulated by Leibniz’s ontological concept of “*correquisita*” or “*consuspendentia*” that is concretely embodied in the “chain of perceptions” or “vinculum of monads.” The definition of the *correquisita* is; without positing them all, the subsequence would not be posited (C.471, Matsuda.2010, 2011a, 2014b, 2017).

metaphysical elucidation of organic body à la Aristotle. Therefore, natural machine, even if it is featured as “infinite nested” by Smith, is to be explicated as a complex of passive second matters and active monads or entelechies. This constitution of organic bodies by monads together with second matters is fairly heterogeneous to the sheer mechanism of Cartesian “extension,” as Leibniz repeatedly emphasizes the role of “representation” of minds to mirror the world in §63 of *Monadology* (GVI.618). This second type of interpretation seems to fit better both for the traditional hylomorphism of substantial form and a sort of immaterial “atomism” of monads in a constitutional way for organic bodies than the mechanist view of them as “infinite machines” does. At least we can distinctively acknowledge the immaterial “form” or monad as “requisite” of living things according to this understanding.

From indicating this subtle concept of the requisite or, more vividly speaking, “monads” in the above sense in for or against contexts of “mechanical reductionism” of lives into matters, we can further enter the problems of reproduction of individual lives and the generation of a different “species” by the “conception” from Leibniz’s texts in connection with his contemporary genetics in the next chapter. However before it, we stay for a while for one of our goals in this paper to explicate some distinctive aspects of organic body (*corpus organicum*) of living things as “divine machine” from artificial machine, not exclusively in its perfectly organized infinity, but rather in something different from the 17th century Cartesian mechanism, as Leibniz himself proclaims, for example, one of his contemporary Cambridge Platonists, Cudworth. According to Cudworth in *The Intellectual System of the Universe* (1678) the “immaterial plastic force” of living things is contained indeed within the matters of animals or plants to cause the changes of the lives and their regularity in the long run, for Cudworth in order to avoid attributing directly this force the creator, God (Cudworth. 146-174); nothing is more intelligible as the cause of all biological phenomena than this immaterial force or nature in creatures that can be never found in the motions of atoms and mechanism of matters. And this vital force works in the bodies of animals and plants as an instrument of divine intellection and skill. On the one hand Leibniz agrees surely with the opposition of Cudworth to mechanical and materialist philosophy of lives in his time and in the antique Greek heretics:

The laws of mechanism by themselves could not form an animal where there is nothing already organized. I find that he [Cudworth] is right in opposing what certain ancients have sensed on the subject, and also Descartes’s *Traité de l’homme* (GIV.543).

On the other hand, Leibniz avoids “animism” in a pre-modern fashion or “vital” medicine in his time, as Leibniz himself clearly rejects them in his controversies with Stahl (cf. Dutens. II.2.136). When Leibniz continues in his critique to Cudworth; “if matter is arranged by divine wisdom, it must be essentially organized throughout and that there must thus be machines in the parts of the natural machine into infinity, so many enveloping structures and so many organic bodies enveloped, one within the other”, he has no

needs to resort to certain immaterial plastic nature of Cudworth. In other words, “material plastic nature” is provided by complex and infinite natural machine from within by itself^{*8}.

So far as the issue is about the explanation of the motions or functions of organic bodies of animals and plants, the philosophical meaning of the distinctions of Leibniz from Cudworth on the one hand and from Descartes on the other is still not sufficiently clear however. For this explication we will seek below a clew of our consideration in his germinal thoughts about a sort of “developmental evolutionism”^{*9} in the pre-Darwinian era concerning the generation of a different “kind” of animals, especially of the rational animals such as human beings. As we shall show it, Leibniz is really faithful to the maxim of “life (*animatus*) comes only from life”^{*10} in a pregnant sense in this “evolutionism.” For him life as such is in fact a primitive concept in this sense in difference to both those of matter as mere geometrical extension and of bodies or particles as infinitely divisible aggregates^{*11}

3. The Generation of a different species in the time of *Monadology*

For us modern readers, §74 and 75 of *Monadology* is *prima facie* so remarkable that it seems to suggest a sort of “generation of a different species” through the reproduction, by adding other biological components such as seeds, spermatozoon or ovum, besides selective elements to elevate the sentient among animals to the higher stage from lower ones. For example, Rescher comments in his commentary about these passages in his *Leibniz’s Monadology* that Leibniz was encouraged by the observations of Leeuwenhoek and that he was convinced of the continuity of the whole organic lives from the beginning of the creation. Rescher continues that “the philosophical core of Leibniz’s assertion is that lives are never initiated *de novo* but that they always pre-exist in some more seminal, rudimentary form: “Life comes only from life”, as we have just suggested it in chapter2. This biological doctrine of spermatic generation is a tailor-made for Leibniz’s doctrine of the continuity of all process of monads, just as it is also the case in his “neuro scientific” doctrine of “minute perception” that is about a kind of “unconsciousness” (Rescher.247). In §74 Leibniz writes;

^{*8}In addition, there is a gap about the image of hierarchical and dynamic orders of creatures from the higher beings to lower ones between Leibniz and New Platonism (cf. Matsuda.2016), as we will show it in chapter 4 of this paper.

^{*9}The author borrows this word, “developmental evolutionism,” to make more explicit one of the feature of Leibniz’s evolutionism before his pre-Darwinian situation from historical works of Bowler about Non-Darwinian Revolutions. I appreciate anonymous referees of this paper especially for their important and useful indications of the complex history of evolutionary biology.

^{*10}Leibniz makes a distinction of it from “traduction from soul (*anima*) to soul” (G II .390) as below.

^{*11}Leibnizian “mereological” approaches to the problem of persistent identity of living things including human beings against their fluid states of their organic bodies are characterized by the traditional puzzle of “the ship of Theseus” from the model of Hobbes (Hobbes.236. cf. AVI. 6.231ff, G II . 77, 370. GVII. 530ff. cf. Van Inwagen.15). In confronting the labyrinth of the composition of the continuum, Leibniz ontologically determines the “simple substance” for persistent identity of living things as a metaphysical point in contrast to both the mathematical and physical points (GIV. 483. Matsuda. 2011a, 2017).

Philosophers have been much perplexed about the origin of (substantial) forms, entelechies, or souls. But today, when we have learned from scientific studies of plants, insects and animals, that the organic bodies of nature are never products of a chaos or decay, but always grow from seeds in which there was undoubtedly some pre-formation, it has been concluded that not only was the organic body already present *before conception*, but also the soul in this body and, in short, the animal itself, and that through its conception this animal has only been positioned for a great transformation so as to become an animal of a different kind (*une autre espèce*). One even sees something like this apart from birth, as when larvae become flies and caterpillars become butterflies (GVI.621. Rescher.242. emphasized by the author of this paper).

The issue here is the origin of forms, entelechies, or souls, namely living things in essential distinction to the body as Cartesian extension and mere aggregates in Leibnizian ontological notion. So as to understand the implication of the perplexity of philosophers about the origins of substantial forms above quoted, it is notable for us that in front of Leibniz there are his contemporary options in the genetics and that he takes a middle way, that is, a version of so called "traduction" or "transcreation" between a (continual) creation and an entire pre-existence as two poles, as he himself explicates it in his *Theodicy* §397 and elsewhere. Preliminarily speaking, "traduction" means that the form of the offspring comes from the parental forms in the same way, as the body of the offspring comes from the parental body or bodies so as for Leibniz to acknowledge both the substantial continuity and the transformation of individual creatures of a certain species in the very long run despite the appearance of genesis of individuals in the quoted text.

According to Leibniz in §86 of *Theodicy*, two dogmas of pre-existence of human souls in another world or in another life: the myth of the metempsychosis in (New) Platonism, especially Origen and the widely accepted orthodox Christian dogma of the creation in early modern era, are fraught with the greatest difficulty of the original sin, because these could cause the typical puzzles of the theodicy^{*12} of the "injustice" of the creator of the souls with various sins in this world. Here without examining these serious theological problems of the original sin, we can only indicate with Leibniz that the third theoretical option of "traduction" of human souls^{*13} has a merit to be able to relatively easily recognize the factual changes or transformations of living things in the natural history also from the viewpoint of "biology"; this theory of "traduction" says, as if the souls of children were produced from the souls of their parents or souls of those from whom their bodies had been produced. If we can literally take a biological hypothesis in his *Theodicy* §397 in connection with this view of "traduction" also in a theological sense, we can understand a

^{*12}In this restricted paper to the problematic of the philosophical biology, we cannot treat the problems of theodicy as such in a comprehensive way. However it is important for us to emphasize that *Theodicy* is not only a masterpiece of theology but also can be read as that of natural philosophy of Leibniz.

^{*13}Leibniz attributes this theory of traduction to Augustine's exegesis of the original sin.

noteworthy role of bisexual reproduction in the series of generation of animals including human beings in the tremendously long history of lives;

The soul preexisting in the seeds from the beginning of things was only sentient, but that it was elevated to the superior degree, which is that of reason, when the man whom this soul should belong was conceived, and when the organic body, always accompanying this soul from the beginning, but under many changes, was determined for forming the human body (G VI. 352. Rescher.245. emphasized by the author).

Leibniz calls this state of affairs also “transcreation” as an extraordinary operation of God in §91^{*14} of his *Theodicy*, besides his mention about “the soul preexisting in the seeds from the beginning” in relation with the evolution of human beings^{*15}. And he continues to suppose a possibility of biological hypothesis about the elevating of the soul from the stage of the sentient to that of the reason without miracles or intervention of God;

Nevertheless it will be well to add that I would dispense with miracles in the generating of man, as in that of the other animals. It will be possible to explain that, if one imagines that in this great number of souls and of animals, or at least organic bodies which are in the seeds, those souls alone which are destined to attain one day to human nature contain the reason that shall appear therein one day, and the organic bodies of those souls alone are preformed and predisposed to assume one day the human shape, while the other small animals or seminal living beings, in which no such thing is pre-established, are essentially different from them and possessed only of an inferior nature. This production is a kind of traduction, but more manageable than that kind which is commonly taught: *it does not derive the soul from the soul, but only the animate from an animate, and it avoids the repeated miracles of a new creation*, which cause a new and pure soul to enter the body that must corrupt it (ibid, emphasized by the author).

Naturally Leibniz himself could not entirely and fully pursue this line of secular and hypothetical thoughts and scientific researches in his necessarily very limited conditions of gathering the sufficient data, besides

^{*14}In presenting three hypotheses about the elevation of the sentient to the rational animals Leibniz says that “animals received reason, where there be a natural means of raising a sentient soul to the degree of a reasoning soul or whether God may have given reason to this soul through special operation, or by a kind of transcreation. The latter is easier to admit, inasmuch as revelation teaches much about the forms of immediate operation by God upon our souls” (G VI. 153. Rescher.244, emphasized by the author). Leibniz examines these possibilities in his *Theodicy* without concluding it (cf.Matsuda.2015a. Broad.117, Fontenay.Part11.ch.5).

^{*15}This issue of seed with genetic information in Leibniz’s philosophical biology from the view point of *Monadology* is to make explicit the dynamic and temporary elements of monads as biotic beings from the theories of the expression, that is, perspective mirroring of the world, and their “memories,” in other words, the information within the seeds. About the biological relevance of this notable notion of Leibniz’s “memory” without apperception in the seeds, see his remarks about Cordemoy (AIV4.1799.Arthur.279. cf. Sleigh.133ff, Matsuda.2014b).

the heretical implications of such an evolutionary thinking still in his time^{*16}. Despite it as a matter of fact, Leibniz dares to talk Des Bosses about the possibility of “the spontaneous emergence by natural evolution (*per evolutionem naturalem*)” (G II. 399.Look.177), in the same period of *Theodicy* for this elevation of human being without miracle. While he tried to partially show his stance of transformations of living things and of the earth as environment in the tremendously long time from his geological and paleontological researches in his work, *Protogaea*^{*17}, we have further a textual evidence of his preference to “natural explanation” from a letter to Rémond^{*18} on the 19th January in 1715 who raised Leibniz the question about the natural becoming of the “dominant monad” that constitutes an animal, to the human beings. To it Leibniz responds by using a metaphor of his infinitesimal geometry; we must conceive the extraordinary time of changes in lives of animals and human beings, as it is also the case that there are distinguished points such as the summits, inflection and cusp in a curve and that there exist lines with such infinite points. We can comprehend such extraordinary time in a general rule, so as we can do it for the geometrical curves (G.3.635. cf. Cassirer. 1998.373). Analogically speaking, a certain state of living thing of a species can be seen no other than as a differential point of an extraordinary time of evolution in Leibniz’s philosophical biology.

In order to show the possibility of the “intermediate species” such as “Plant-Animaux” called by Buddeus, Leibniz had actually appealed for his principle of continuity in his letter to Varignon in 1702 by using the same geometrical model such as the conic curves (LP.260ff). From the principle of continuity it can be deduced; if essential determinations of the one being approach to those of the another, all other properties of the former must gradually approach to those of the another. As a matter of fact all conic curves can be geometrically proven to be as one and the same kind against the appearances of their very different shapes. While there is no “intermediate species” among four conic curves as geometrical species, there must be such “intermediate species” in the nature, although we cannot observe them yet in the earlier stage of the natural history according to Leibniz. The application of the principle of continuity here is obviously temporal, for Leibniz says before treating the biological problems that all is connected in the universe, because the present state is pregnant with the future and every given state can be naturally explicable only through its immediately preceding ones^{*19}.

^{*16}This concern is expressed by Des Bosses in his letter to Leibniz about the work of Liceti’s (1577-1657) genetics of the human soul in 17th century in Italy. Leibniz tried to persuade Des Bosses that the work be not always dangerous (G II. 396. Look.157ff).

^{*17}Because of the text critical difficulties of a few different versions of *Protogaea*, we would like to fully discuss more subtle problems about *Protogaea* (cf. Smith.2011.255ff, Strickland) in another opportunity.

^{*18}Leibniz wrote his *Monadology* for the request of Nicolas Rémond, as it is well known.

^{*19}This claim is paraphrased in the letter of Leibniz to Bourguet in August 1715: the preceding instants (of the universe) have always priority over the succeeding ones not only temporally, but also naturally (GIII.582).

Therefore with sufficient reasons we can further trace the biological implication of his view of “evolution” of rational animals, that is not restricted solely to the ontogeny of each individual by bisexual reproduction without miracles also in his letters to Bourguet^{*20} in the time of *Monadology*, because their correspondence can be understood as further evidence of his purist for a biological hypothesis of traduction or transformation towards the “developmental evolutionism.” Before turning to those texts, we make sure this issue from §75 of *Monadology*;

The animals, some of which are raised through conception to the level of the highest animals, may be called spermatic. But those among them which are more typical, that is, the majority, are born, multiply, and are destroyed just like the higher animals, and it is only a few specially chosen ones that achieve a larger role (G VI. 620.Rescher.248, emphasized by the author).

Here we can imagine somehow about a sort of “election” in the process of the elevation of lives, although Leibniz himself did not actually explain about the details and because of it this paragraph should be seemingly related only with the ontogeny. Cannot we ask then whether Leibniz actually anticipated the “evolutionism” in any sense^{*21}? In one and restricted sense, yes, insofar as he could acknowledge both the genetic role of conception for the emergence of a different “species” and a sort of election in its extraordinary long process of elevation of animals including human beings to higher stage of reason as faculty of an animal on the whole. However we must soon emphasize that his evolutionism is naturally neither the historical Darwinian in 19th century nor standard contemporary Neo-Darwinism since 1940s which is based on the theory of random mutation and natural selection in the environment, both without any teleological and theological explanations. As Bowler (cf.Bowler.1984, 1988) emphatically shows the long and complex history of the Darwinian and Non-Darwinian “evolutionism” before and after Darwin, these genuine two Darwinism are surely not “progressive” or “developmental,” as it is the case in Leibniz at least about the evolution of the human being as rational animal in *Monadology*^{*22}. In this regard our claim on Leibniz’s developmental “evolutionism” remains a possible interpretation of a historical episode of biology within Leibniz studies. Nonetheless we pursue something more philosophical in his thought about his concept of the developmental evolution of lives beyond historical interests.

^{*20}Louis Bourguet (1678-1742) is the author of *Letters philosophiques sur la formations des sels et des cristaux, et sur la generation et le mecanisms organique des plantes et des animaux, à la l’occasion de la pierre belemnite et de la pierre lenticulaire; avec un mémoire sur la théorie de la terre*, Amsterdam, 1729. He defended Leibniz’s natural philosophy after Leibniz’s death, although he himself did not perfectly agree with Leibniz (cf. GIII.539). Duchesneau gives Bourguet the chapter 6, “Bourguet and new models of organic bodies” in his book where Bourguet is seen to be a successor of Leibniz (Duchesneau.2010).

^{*21}While Roger sees Leibniz as a forerunner of “evolutionism” in his *Les sciences de la vie dans la pensée française au XVIII^e siècle* (Roger.370), Smith clearly rejects so an interpretation about Leibniz’s anticipation of thoughts of “evolution” in Darwinian sense (Smith. 2011.254).

^{*22}In the works of Bowler, Leibniz does not play an important and eminent role for the history of “evolutionism” in both sense, while he mentions the biological role of Ch. Bonne about the great chain of being in contrast to the seminal works of Lovejoy (cf.Bowler.1975.95ff, Lovejoy.259, Glass.37ff).

For this aim we will make much clearer the contexts of the letters of Leibniz to Bourguet by glancing at the variety of the “biological” thoughts about the generation of lives in 17th century. In his commentary about the passage of §75 of *Monadology* Rescher refers to Latta’s insufficient and misleading remark^{*23} of the historical backgrounds of Leibniz’s evolutionism: before Leibniz in early modern era, the origin of life was explained either by a theory of “traduction” or by that of “education” according to Latta. On the one hand, after the standard theory of traduction, as above mentioned, the form of the offspring comes from the parental forms in the same way, as the body of the offspring comes from the parental body or bodies. On the other hand, according to the theory of “education”^{*24}, life comes from inorganic matter, from “chaos or putrefaction.” This concept of the education corresponds to the “spontaneous generation” of lives that was ultimately disproved by Pasteur later in 19th century. Leibniz modifies this theory of “traduction” in his own way by thinking that “the production does not derive the soul from the soul, but only the animate from an animate” and he rejects the “education” as the rise of life from mere matters. Thereby the maxim of “the animate from an animate” implicates the developmental evolution of living things from living things. And this “traduction” is further combined with Leibniz’s version of “preformation.” However Latta said nothing about this connection with the notion of “preformation” in Leibniz.

After the popular understanding of preformation in 17th century, the germ contains in miniature the whole plant or animal, point for point, and accordingly the “form” of the plant or animal exists in the spermatozoon in a contracted or “enveloped” state just as it is known as “Homunculus” in a caricaturized style from the beginning of creation, according to the authority of the Scriptures. Although Leibniz himself agrees with the claim of endlessly small micro worlds within animal bodies by his admiration of the observations by Leeuwenhoek’s microscope and he also claims that there is no limit to the smallest of things, and even a spermatozoon may contain an indefinite number of other beings, he does not naively stand for the generation from preexistence of the form in the seeds without any theoretically decisive modifications of meaning of “preformation.”

Leibniz’s own theory of the generation is indeed more complex and in part based on the various empirical observations of the transformations of animals and plants in natural history. As we can theoretically reconstruct the lineage of the species from their traces since Darwinian revolution today, Leibniz reasons about not only the genetic facts of the variety of the species of dogs and plants from the experiences of breeding, but also the naturally happened subdivision of antecedent common species of the cat family into their various kinds in the Book III. ch.6 of *New Essays* (cf. AVI. 6.325 and 317) that raises really the question about the fixity of species of living things including human. For this topic Leibniz dares

^{*23}Robert Latta published his English translations of *Monadology* and other writings in 1898.

^{*24}The conception of “education” that sounds strange for us modern, comes from Latin verb, *educō* that means originally “spring up.”

to talk about the metaphysical dimension of the “temporalization of the grate chain of being” (cf. Lovejoy.259) concerning biological individuals from his “nominalist” standpoint^{*25}.

And this issue of the generation in Leibniz is in a rather natural way extended to the genetic role of an ovum in the conception in contrast to the traditional Aristotelian theory of the sperm. Just his correspondences with Bourguet on 22th March 1714 and on 5th August 1715 (GIII.564ff and 578ff) tell us interesting remarks about the controversy concerning the roles of the ovum and sperm between Vallisneri^{*26} and Leeuwenhoek in the genetics in his time. While in the first letter to Bourguet Leibniz primarily inclines for the opinion of Leeuwenhoek who asserts the dominant and efficient role of “animating” spermatozoon over that of the ovum in the process of the generation according to the Aristotelian tradition, Leibniz does not unconditionally reject at all the probability of the more positive and vital function of “inanimate” ovum on the side of Vallisneri and Bourguet whose microstructure or base for transformation will be discovered and explained after them.

In his letter Bourguet raised Leibniz this question among many intriguing ones from Spinoza interpretation to the philosophical problem of time. And in his letter of 5th August 1715 Leibniz neatly responds to the objections of Bourguet one after another. Our problem is the fifth of them about the generation of animals and a critical comment on the conjecture of Bourguet about that all human seminal animal would at last become “rational” ones. Leibniz praises this as “possibly true,” however “not necessarily.” It is remarkable in this correspondence that Leibniz does not hesitate seriously to take the possibility of seeds for generation of a different species, not only in the spermatozoon as in Leeuwenhoek, but also in the ovum as in Vallisneri. Thereby, rather exaggerated speaking, he could almost approach a modern sexually egalitarian notion about the genetics from the view point of microstructures of the ovum which could not be yet perceived by microscope at that time, to cause the change of various living things by the conception or copulation, as it is the case for the gens of maternal and paternal origins in molecular biology today. This would be simply no more an Aristotelian view. Leibniz and Bourguet could hypothetically have shared a sort of developmental evolutionism based on the natural genetic “recombination” by conception at least in its probability^{*27} which is not sufficiently paraphrased in §74

^{*25}This interesting issue cannot be pursued here. However one thing must be confirmed that in a strict ontological sense one and the same individuals change always from “a species to other species” according to the principles of the identity of indiscernible in Leibniz, although the species here does not always mean the same as that of biological entity in modern sense (AVI. 6.308. cf. Matsuda.2015b, Mayr.1998.335ff).

^{*26}In opposition to Leeuwenhoek as a representative of the Spermatism, Vallisneri (1661-1730) was an Italian representative of the Ovism. Please see more about Vallisneri in the works of Duchesneau (Duchesneau.2010.201ff) and Roger (Roger.1993.373ff).

^{*27}If it is actually right, it raises a problem of identities of persistent persons from the view point of conceptual constitution of individual substances like Caser or the Alexander the great, as it was supposed in his *Discourse of Metaphysics*. While this metaphysical and logical notion of a priori complete concepts of individuals can be compatible with two sources of heredity of a certain child from its parents those who have two originally different complete concepts, there

and 75 of *Monadology*. After Leibniz agrees with the assertion of Bourguet about the possibility of transformation of small animals in the ovum into full-fledged animals, he adds;

If these were true seminal animals, they would necessarily remain a particular species of living things some individuals of which would be elevated to higher degree by transformation. While I dare not to assure that your sentence be false which is going to suppose that the animal towards the transformation is already in the ovum, when the conception occurs (GIII.580ff).^{*28}

From our considerations about “Leibniz and Biology” hitherto at least as a first approximation of our interpretation, we can confirm the identity and the difference of the animals including human beings, whether these be individuals or a species, in the process of transformation or development from “the lower to the higher degree” or from “the sentient to the rational ones” within the framework of “life comes only from life.” Leibniz repeatedly appeals this so to speak “anti-reductionist” principle of lives into mere matters in his controversies and its truth claims not only in his genetics of organic bodies from invisibly small seeds, but also his natural history of lives to elevate animals to rational beings since the creation of the earth. And in his insight about these transformational or developmental moments of the “evolution” of lives in the horizon of the continuity of all lives in natural history we can find his unique position in opposition to both Cartesian and New Platonist philosophy of lives.

4. A look for further consideration of philosophical biology

How should we evaluate Leibniz’s philosophical biology finally? Is it either solely a historical episode of a transitional phase in the prehistory of scientific biology or something else? Here we can give a brief prospect to this question instead of giving a decisive conclusion; this is about the implications of Leibniz’s philosophical biology beyond the curiosity of history of biology. To assess it from a certain philosophical frame of reference, we would like to introduce Hans Jonas’s philosophical interpretation of modern biology in his “Philosophical Aspects of Darwinism” in *The Phenomenon of Life towards a Philosophical Biology* in 1966, because he gives us a view of the philosophy of life in broader perspective until the existentialism in 20th century.

After Jonas, in Darwinian “evolution” individual “organisms evolve the higher forms”^{*29} without their being in any sense “involved” in the initial stage against the notion of preformation and “unfolding” (Jonas.43) that is a synonym of Latin word “*evolutio*” also detected in Leibniz. Through the comparison with his explanation of this gap of the meanings of “evolution,” we can understand a unique historical

remains a riddle of one and the same “bearer of the predicates” through the repeated numerous recombination.

^{*28}In his famous and important series of philosophical letters to Des Bosses, concerning the biblical theme of the “creation of animals,” Leibniz expresses his hope that this type of explanation will be also scientifically verified (cf. G II.389ff).

^{*29}As already seen in this paper, strictly speaking, Jonas’s conception of Darwinian “evolution” here naturally does not coincident with genuine Darwinism, either historical Darwin one in 19th century or Neo-Darwinism in 20th century, but rather typically with the developmental evolutionism.

position of Leibniz's philosophical biology and its possible impact to our thinking about life. For this aim, it is helpful for us to see as a case that Jonas's general scheme about the history of philosophical biology and the scientific biology does not perfectly coincide with Leibniz's own concepts of "evolution" that we have outlined. And that is beyond what we can imagine from usual descriptions of Leibniz's monadology in the western history of philosophy.

Succinctly speaking, according to Jonas's view, after the breakdown of New Platonist eternal hierarchy of beings from the highest "One" as the origin of all beings, to the lowest matter as quasi "nothing", by the Cartesian harsh mind-body dualism and his consistent mechanism of animal bodies, the ontological continuity of all lives or "the great chain of beings" from plants, animals and human souls under the influence of "emanation" from the "One" was totally disappeared. Therefrom especially the human "mind" is transformed into an isolated and privileged *res cogitans* in this world, both ontologically and ethically. Needless to say, Leibniz was also directly faced with the predicaments after Cartesian philosophy, as he tried to overcome them with his hypothesis of "pre-established harmony" that has been mentioned in the context of reintroduction of substantial form in chapter 2 of this paper^{*30}. Against the main stream of the early modern dualism and mechanism, "Darwinism" conquers this ontological discontinuity especially between animals and human beings by the theory of evolution from the flat bottom. According to Jonas, then the meaning of "evolution" has been drastically reversed before and after "Darwinism" in his rather general understanding. However we have then another philosophical difficulty to understand our own separated living beings in front of the bare facts of inorganic matters by which the life remain to be insufficient to explain. Jonas indicates in it an extreme consequence of "Darwinism" that "poses the question whether a mechanistic biology can do justice to the phenomenon of life" (Jonas.52).

In our context, that is no other than one of the essential problems of "reductionism of lives into the matter." As we have seen it, Leibniz's philosophical biology is faithful to the maxim of "life comes only from life." Here without entering into Jonas's own philosophical biology, we can make sure that Leibniz has traditional notions of "evolution" in the sense of "unfolding" of preformed essence enveloped in the seeds on the one hand and that he has unremarkably also a different kind of the concept of "evolution" such as the generation of a different and "higher" species through the bisexual reproduction and the "selection," even if the details of these genetic and evolutionary processes could not be accessed by Leibniz himself^{*31}.

^{*30}Jonas treats thematically also Spinoza's biology in *Ethica* because of the anticipation of the view of the life as a dynamic equilibrium system of "individuals" and the environment and he is also interested in the *Monadology* in the context of overcoming the Cartesian dualism of mind and body as well.

^{*31}The conceptual problems of "evolution" are further to be historically examined in the situation also before the established doctrine of fixity of a species by Linnaeus. Mayr did it in connection with historical Darwin (Mayr.1988). The author of this paper gives a comparative consideration of Leibniz and Darwin from five criteria of Mayr; the nonconstancy of species, the decent of all organisms from common ancestors, the gradualness of the evolution, the multiplication of species and natural selection (cf. Mayr. 2003.94. Matsuda.2015b.) For Leibniz we can only and briefly enumerate his parallel thoughts about the "evolution" such as the temporal transformation of a species, the continuity of

Generally speaking, in opposition to Spinoza, for example, Leibniz metaphysically takes “becoming” for something positive and progressive in axiological sense that is also valid for living things to have an inclination naturally to evolve for the “better” rather than “worse” in their given and natural historical environments^{*32}. In this sense, Leibniz’s monads as “lives” are essentially and temporally not in the equilibrium at all, as it is said in the §22 of *Monadology*: “As every present state of a simple substance is a natural consequence of its preceding state, so is its present pregnant with the future” (GVI. 610). We can interpret this well-known sentence from our readings of monadology of life based on the unique view of Leibnizian developmental evolutionism, so as to philosophically rethink about our lives and the biology as a hint^{*33}. When we finally observe that Leibniz’s metaphysical principle of sufficient reason is basically determined by the maximum or optimal variety of beings in the world, that is the convenience or fitness of the factually existent beings on the whole (cf.C.376. GVI. 459, 614ff), a philosophical possibility will be given for us further to search after the truth of life and living things from historical considerations about the great thinker such as Leibniz.^{*34}

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References: In this paper the following abbreviations of Leibniz’s works and translations are used;

- [1] G: *Die Philosophischen Schriften von G.W.Leibniz*.ed.C.I.Gerhardt.1965.Olms. Hildesheim.
- [2] A: Leibniz, G, W., *Sämtliche Schriften und Briefe*. ed. die Akademie der Wissenschaften zu Berlin.1926ff.Akademie Verlag. Berlin.
- [3] C: *G.W.Leibniz Opuscles et fragments inédits, Extraits des manuscrits de la Bibliothèque royale de Hannover par Louis Couturat*.1966.Olms.Hildesheim.
- [4] Dutens: *Leibniz, Opera Omnia*.1989.Olms.Hildesheim (1768. Genève).
- [5] LS: *G.W.Leibniz Schriften zur Logik und zur philosophischen Grundlegung von Mathematik und Naturwissenschaft*. 1992.ed.tarns.Herring.H.,Darmstadt.

all living things, and the theological preference to the diversity of beings, finally the convenience or fitness of the existent beings on the whole as the sufficient reason of contingent truth in his general frame work.

^{*32}This metaphysical thought of the continual growth of the perfection of this world over time can be seen from his manuscript (cf. AVI.4. 1642ff) and his letter to Bourguet in August 2015 (GIII.581ff. cf.Matsuda.2015a, Rateau.).

^{*33}If we would take seriously an alternative gestalt of biology such as, for instance, “disparity” evolutionism that tries to explain both the principles of the conservation of the stable states of present organisms and those of their tendency of mutations towards the variety of future states of living at once, it could be a way of further thinking. This interesting idea of “asymmetric evolutionism” is exposed by Furusawa (1998, 2010).

^{*34}The author of this paper concentrates on the aspect for or against the “reductionism,” that is a gap between organic and inorganic matters, rather than other related topics of philosophy of biology such as “Panglosism” or optimality in the evolution, as it is discussed by Radner or Dennett (cf.Matsuda.2011b).

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