

METHODOLOGICAL VS. METAPHYSICAL VITALISM IN HANS DRIESCH'S RESEARCH

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ABSTRACT. *The aim of the present work is a reconstruction, analysis and elucidation of Hans Driesch's vitalistic conception insofar as it was developed in the course of his biological and philosophical research.*

I am presenting two kinds of perspectives, i.e. methodological vitalism and metaphysical vitalism in Hans Driesch's interpretation. I am arguing that methodological vitalism, in contradiction to metaphysical vitalism, is a conditionally valuable investigative perspective developed in the biological course by Hans Driesch.

In favor of this thesis, I am analyzing Driesch's fundamental concepts (e.g. prospective power, prospective meaning and harmonious-equipotential system), as necessary means—in his opinion—to be used in effective research and observations in the domain of morphogenesis, aimed at revealing the developmental specificities of organic phenomena in contradistinction to inorganic phenomena.

KEYWORDS: entelechy, psychoid, methodological vitalism, metaphysical vitalism, prospective meaning, prospective power, system harmoniously-equipotential.

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Introduction

I am going to describe and succinctly characterize two types of research-perspectives developed by the famous German embryologist and philosopher, Hans Driesch (1867–1941), *i.e.* the *methodological* and *metaphysical* vitalism.

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As a matter of a fact, Driesch himself did not use terms like “*methodological vitalism*” resp. “*metaphysical vitalism*”. Nevertheless, in his scientific research as well as in his philosophical deliberations, he was always quite aware of the existence and essential difference appearing between such two scientific and philosophical dimensions of his life-work. This was so in spite of the fact that both of these perspectives were strictly interwoven with each other in his life’s activity.

Since the uniformly developed research-analytical standpoint of Hans Driesch’s both dimensions of his vitalism, *i.e.* the methodological and the metaphysical one are strictly interwoven with each other, it is no wonder that normally these have not been discerned from each other by historians of philosophy as well as science or by scientists analyzing Driesch’s scientific achievements.

Yet, it is quite possible to discern and clearly characterize both of these methodological perspectives developed by him in the course of his biological research and philosophical elucidations.

Usually, historians of philosophy think that problems and analysis in Driesch’s research are in modern times are of no scientific or philosophical interest. This may be taken, however; to be not so much as an outcome of a thorough methodological and philosophical criticism of his vitalism in all its dimensions, but rather as a consequence of a heuristic sterility of this standpoint in the course of contemporary biological research especially in comparison to such a fruitfulness characterizing disparate reductionistic conceptions of the research approach to living phenomena. This is just, for example, how Ernst Nagel argues (Nagel 1970, p.369).

However, in my opinion, Driesch’s methodological vitalism possesses positive value of the inspiring–heuristic character. It has been appearing in the course of scientific research carried out in embryology in general; it was so, beyond any doubt, at least in the course of Driesch’s own scientific research. Some important scientific inspirations have been taken from his conceptual developments; also those concerning the specifically vitalistic notion of entelechy as a kind of a life-factor – a term taken over from philosophical tradition going back to Aristotle. Even tentatively determined, the concept of the entelechy has greatly inspired Driesch’s experimental research in the domain of the organic morphogenesis; the very primary intuitive content of this concept inspired Driesch, in his own scientific research, as concerns his concrete morphogenetic concept-construction, in planning and carrying out his morphogenetic experiments and observations, as well as in his theoretical generalizations aimed at showing off the qualitative specificity of living phenomena.

Even a quick look at some of Driesch’s scientific research and achievements illustrate beyond any doubt the cognitive fruitfulness of his methodological vitalism.

In order to prove this, I am going to describe below, in a very brief way, two of Driesch’s crucial experiments in embryology which had been the point of departure for his further biological research and inspired him to further philosophical enquiries and, finally, even to his later overtly metaphysical speculations.

1. Experiments

EXPERIMENT 1

Driesch has been shaking an embryo in the second stage of a cell division and in some cases he succeeded in killing one of the blastomeres without injuring the second one or else he succeeded in separating two blastomeres one from the other (Driesch 1908, p.60).

In this kind of experiments, Driesch has been separating one of many cells into which a zygote has been divided during a process of its ripening. Such a separated cell, one of four, or of eight, or of sixteen, or of more cells constituting the early form of an embryo, might then develop quite independently of the rest of the cells, making up in effect a whole and complete organism. It meant that from the primary one germ, as constituting a complete whole object, one might obtain many embryos which also constitute complete structures; this was so quite independently from the fact of into how many parts the original germ has been divided if only the smallest part of the original germ had not been smaller than a cell.

After a series of such experiments, carried out in differentiated physical conditions (attainable, among others, by means of diluting sea water or by increasing its temperature), Driesch has finally obtained a result which was quite different from the one obtained by Wilhelm Roux's research which have been devised from the point of view of mechanistical perspective.

Wilhelm Roux's experiments have been carried out in a scientifically correct way but they were based on theoretically inaccurate, fundamental premises. Roux believed that a course of a cell differentiation depends completely on its preformed constituents making up together a kind of spatial mosaic and leads to their duplication so that any experimental disruption of this fixed order might lead unavoidably to the destruction of the cell itself. Driesch's vitalistic approach consisted of rejecting of this mechanistic view and accepting instead an epigenetic conception of the structure of a living cell as equipotentially developing system. In effect, his experiments have been planned to reveal the laws of kind of a structural creativity appearing in primary stages of the organic development.

EXPERIMENT 2

Driesch has succeeded in pressing rather tightly *Echinus'* eggs between two glass plates without killing them. Then the eggs became deformed to comparatively flat plates of a large diameter. In those eggs, all nuclear division occurred at the right angles to the direction of pressure, *i.e.*, in the direction of the plates, as long as the pressure lasted. But as soon as the pressure has ceased, the divisions began to occur at right angles to their former direction (Driesch 1908, p.63).

Driesch argued that owing to the fact of a differentiation of pressure exerted on the embryo during his experiments that he was able to obtain any forms of cell divisions that he wanted. When he exerted pressure on the eggs until the end of the eight-cell stadium of the embryo division then he obtained a plate compound of eight cells placed side by side *i.e.* one by the other instead of two rings each compound of

four cells placed one on the other, just as it used to be in a normal cell division. The ensuing cell division, however; has been coming in the right-angle direction with respect to the previous cell division, and an outcome of this process had a form of a sixteen-cell stadium of the embryo division, compound of two, eight cells plates placed one on the other. When the pressure has continuously been exerted until the sixteen-cell stadium of the embryo division was attained then all the sixteen cells were placed on one plate and side by side one by the other, the result of the further divisions were two plates, each compound of the sixteen cells placed one on the other (Driesch 1908, p.63)

According to this briefly presented Driesch's experiment, one might say that the normal or undisturbed development of any organism is by no means and in general, the necessary condition of the completeness of this development. It became quite clear that the respective spatial relations existing between different divisions of a cell nucleus are something quite normal. There could not be any closed relation between single divisions of a cell nucleus and the development of organs in general.

Also, all these experiments have demonstrated that most of the germs may, after sometime, start to carry out different functions than it has been done before, *i.e.* during a normal or undisturbed development. One might even say that despite of all those experimental manipulations performed on embryos we could see some kind of a capability and even tendency of living organism towards the holistic development. Driesch formulated following specific terms of his vitalistically inspired methods of research in the domain of the embryogenesis: *prospektive Bedeutung* (a prospective meaning) and *prospektive Potenz* (a prospective power). Their meaning might be briefly explained as follows (let us put it verbatim in Driesch's own words):

Suppose we have here a definite embryo in a definite state of development, say a blastula, or a gastrula, or some sort of larva, then we are entitled to study any special element of any special elementary organ of this germ with respect to what is actually to develop out of this very element in the future actual course of this development, whether it be undisturbed or disturbed in any way; it is, so to say, the actual, *the real fate* of our element, that we take in account. I have proposed to call this real fate of each embryonic part in this very definite line of morphogenesis its *prospective value* [prospective Bedeutung in German]. (Driesch 1908, pp.76, 77)

And, at the same time, Driesch has emphasized that in order to be able to do this, it is necessary to earlier introduce some other concept, *i.e.* the concept of "prospective potency" or "prospective power" of every of the embryo's parts. This last term should designate a possible fate of every one of those embryo's parts (once again verbatim in Driesch' meaning):

We first introduce a second concept: the term *prospective potency* ("prospective Potenz" in German) of each embryonic element. The term

“prospective morphogenetic potency” is to signify the *possible fate* of each of those elements. (Driesch 1908, p.77)

All developmental possibilities (*i.e.* potentialities) of a definite part of an embryo might be carried out by means of respective experimental disturbances of the course of organic processes under investigation when these disturbances are conducted in appropriate laboratory conditions. Driesch stated that experiments concerning the separation of some parts of an embryo demonstrate that the *prospective power* of every element of, for example, sea urchin (*Seeigel*) egg is constant and that its possible value is variable. That is why the development of any group of cells of a blastula of the sea urchin would always happen with respect to the whole organism since it is always oriented in this generally holistic direction by the appropriate prospective power (*prospektive Potenz*). And, it is worthwhile to emphasize that, as it appeared, the main aim of the development might be attained in many different ways; that is why the further destiny of the sea urchin cells is characterized as a variable one.

2. System harmoniously-equipotential

In the course of his further research, Driesch has come to a formulation of a concept of a harmoniously equipotential system whose role was to express an occurrence of a constant prospective power (*prospektiven Potenz*).

The living objects of Driesch's research have been equipotential systems in the sense that each of their constituents might play a separate function as a part of the entirety of processes appearing in the whole living system; such a role has been called a “function of place (location)” or “function of the position”. That is why the systems in question could be designated as the equipotential systems with separate powers, or shortly: the individually equipotential systems (Driesch 1908, pp.120, 121).

Driesch attempted to demonstrate that equipotentiality of a system consists among others in that every of its parts plays some determined role only with respect to the whole system in question – *i.e.* with respect to what is going on in the entire system. Every part of such a system is placed (located) in a way guaranteeing its determinate contribution to the construction of the system in question as a whole as well as to its reconstruction (*e.g.* during a process of regeneration), and it is also able to perform the same tasks which are playing other parts of the system.

Driesch came to the expressly vitalistic conclusions asking the following question: under which circumstances might be made conditional the prospective meaning (*prospektive Bedeutung*) B in all cases of an experimental influence (*e.g.* shaking, separating) on the element X?

Driesch has presented following factors in question (shortly but strictly according to Driesch's meaning):

First of all, the prospective meaning of every element of the living system depends undoubtedly on and is a definite function of, the *absolute size* of the part of the system in question appearing in it in a given case. Let s symbolizes the absolute size of a system in any case of a process of morphogenesis. Then we can state symbolically the appropriate function a prospective meaning of an element of the living system: $B(X) = f(s\dots)$. As it appears, we should assign additionally other quantities to the symbol S , however. (Driesch 1908, p.114)

One might say that the prospective meaning of an element of a germ depends on the absolute (total) size of a system, insofar as it is taken in its state just before its morphogenetic change. Constituents of the system have substance (as if to “know”, in a way, of how much), which is shaping organs or tissues, and which should be produced in order to guarantee the complete outcome of the organic development.

Referring to Driesch’s meaning: from the analytical point of view, one can say that the destiny of every constituent of the developing germ is changing in dependence on the actual place of real border-lines between parts a^1, b^1 or a^2, b^2 , with respect to the fundamental direction-lines or sides of a rectangle a, b under investigation. Let us designate this location by means of the symbol l as meaning that a distance of one actual border-line of the given organic part as determined with relation a to b . Then we could introduce the following, more developed formula of the function in question: $B(X) = f(s, l\dots)$, (Driesch 1908, p.124).

The point is that constituents of a germ should be located in any living organism with respect to appropriate constant points of the system. That is why they can come into being, in effect, the definite organic form, since the peripheral cells are behaving in a different way in comparison to those appearing in the center of the system (Weber 1999, pp.265–295).

Then, one of the most important of Driesch’s conclusions has been developed (while accentuating its essential methodological meaning) in the following way: the prospective power of the system in question, or rather of every of its constituents, is the sum of that what may be carried out in the system by every of these constituents. Yet, the fact that in every possible case there happens a typical proportional development is the actual proof that this sum is not only the simple one but it is presenting a kind of an order. We may call this order a “dependence of location in the absolutely normal case”. But since we ought to remember that a “prospective power” or, as it can be otherwise expressed, a relative proportion which is determining foundations of the harmonious character of the living system, always should co-determinate this state of affairs, then we may be authorized to apply this expression without any ado or explanations to the designation of some constant factor on which there depends the prospective meaning of every element and constituent of the living system. If we designate the order embracing the prospective power of an organism by a parameter-symbol E , then we might be able to complete finally the above stated symbolic expression to the form: $B(X) = f(s, l, E)$ [Driesch 1908, p.124].

At this very point of his scientific-experimental research and conceptual-theoretical analysis, Driesch came to a conclusion that apart from some important but variable factors such as size or location of constituents of a living system, there is the invariable value *E* which could embrace the future potency of this system although it would not be identical with it. Driesch observed that in principle, in every experimental case as well as in the normal development of the living organism there is a factor determining its form which factor becomes always the same. Driesch's experimental observations, concentrated exemplarily around cutting across in any way of the sea urchin (*Seeigel*) germ, have demonstrated that every part of the germ is able to develop into a smaller nevertheless functionally complete living organism.

According to Driesch, the factor *E* was to be a kind of a *quasi*-physical parameter peculiar to living world and responsible for the localization of an organic differentiation. One can add that this factor was to play the main role in the actual, primary and fundamental conditioning of foundations proper of the very existence of any creatures of living world.

It is necessary to emphasize that in Driesch's opinion, entelechy has not been the source of any form of energy with respect to the parts of matter appearing in structures of a living world but it were to act on them by means of some or other form of a limitation or suspension of the range of their possible reactions.

Now, let us briefly assess some of the effects of Driesch's scientific and philosophical endeavors. Firstly, we will assess the negative ones.

Looking at it scientifically and in general, Driesch's theoretical efforts to effectively establish entelechy as the essential and specific parameter of a living world have appeared to be completely in vain.

Of course, Driesch's secondary methodological aim which consisted in his attempts at constituting biology as one of the elementary sciences of nature, even on par with physics also appeared to be futile. Biology, projected as the elementary science of nature, was to have its own fundamental laws of nature as based on its own primary parameter of natural objects appearing in all living phenomena. As a matter of fact, this is not or rather could not be the case.

There seems to be, however; many positive aspects to all of Driesch's undertakings.

It is still interesting to carefully analyze his efforts in the theoretical-interpretative dimension of experimental research. It is particularly so where it concerns the question of some postulated relations of the entelechy as the alleged specific parameter of life with actual physical parameters characterizing the natural world. This problem deserves further investigation.

It has become quite clear that Driesch just provably demonstrated in his experimentally based considerations how much – in many cases, even just completely – insufficient is any mechanistical view of the living world, just as concerns compound organic processes. This has promoted a kind of anti-reductionistic philosophical approach with reference to the dominating mechanicism in biology and

what is to be seen quite easily in the course of Driesch's analysis presented in his research-dimensions.

It is worthwhile to note that almost all of the elements of research terminology consisting of dimensions of Driesch's methodological vitalism appear to be, in principle, useful and actual still today (Ostrowski 1983, p.82).

For example, conceptual constructs concerning problems connected with organic totipotentiality, on the ground of which Driesch has been developing his main morphogenetical research and analysis, is still the essential source of key concepts of the biology of organic development (Lenartowicz 1992).

While being quite unaware of the fact, we may even dare to say that Driesch developed a kind of research which presently concerns living phenomena characteristic for cloning of animal organisms. Driesch's experimental divisions of germs which were compound of two or four cells, in order to create identical twins or quadruplets of sea urchin have been perhaps the first successfully carried out attempts at an, supported by man, animal cloning which started with a single cell (Wilmut et al. 2002, p. 90).

Why, then, Driesch's life activity is usually assessed in the decidedly negative sense?

I think that it is a matter of incorrect "optics" of looking at the effects of Driesch's endeavors.

When looking attentively at the real stages of the development of Driesch's research and considerations, we may just see what follows.

While determined by his heuristically fruitful experimental research but unable to state the factor *E* as a scientifically grounded parameter of the living nature, Driesch has started little by little to go beyond science into metaphysical areas by attributing to the *E* category extra spatial properties.

At first, entelechy was to be a kind of an intensive diversity (*intensive Mannigfaltigkeit*) of spatial and temporal – so that visible – diversity of structural properties which have been appearing in the course of the processes of organic development like embryogenesis. It is worthwhile to emphasize that Driesch before attributing to entelechy the extra spatial properties from his later completely developed metaphysical vitalism, has tried to find the factor-parameter *E* exclusively in the domain of natural structures of living organisms and so proceeding only on the level of his methodological vitalism.

On the other side, entelechy, as understood on the level of Driesch's metaphysical vitalism, was to "act" respectively in the space, but it was at once to "exist" somehow outside the space so that it could not be located in any spatial point occupied by living organisms. It was to act in the particular parts of the organism not undergoing, however; any division into particular parts.

According to this last concept, entelechy was to be deprived of any quantitative properties. This meant that its inner diversity could not be understood in a way according to which its parts might occur in different points of space and time in the living world. In this way, Driesch wanted to explain the fact that spatial divisions

carried out, for example, on the body of a germ were not able to impede the capability of entelechy to drive the harmonious development of a germ.

3. Psychoid as a category of metaphysical vitalism

This essentially substantialist interpretation of the category of entelechy, as developed by Driesch mainly in the course of deliberations based on his metaphysical vitalism, was concerned not only with the processes of embryogenesis but additionally the *psychoid*, a kind of a *quasi*-conscious entelechy, and so they were to have an influence on organic movements of animals including a man.

As a matter of fact, at this very stage of his philosophical speculations, Driesch has clearly, decidedly and effectively started to substantialize the concept of entelechy itself in a metaphysical way, and exactly in the strictly psychological sense. Although, on the other side, no one could fully know why he was afraid of using such terms like “psychical” or “psychological” with respect to research of organic movements connected with experiences of the highly organized animals.

Let us briefly indicate the main direction of Driesch’s analytical interests with respect to the other extra-morphogenetic types of organic phenomena in the dimension of his metaphysical vitalism.

The further tasks in research undertaken by the embryologist were those in the area of a physiology of organic movements aimed at developing foundations of his further philosophical deliberations; and not only those of the strictly scientific and methodological type but also, and in addition, those undertaken for purely speculative and metaphysical reasons (Driesch 1908, p.289). Driesch’s research in this domain concerned organic movements treated as reactions on external stimuli (Driesch 1908, p.290).

The commonly accepted physiology of that time has been concerned exclusively with a cooperation of parts of organisms. In Driesch’s opinion, this was not enough; he tried to find some additional criterion for explaining specific aspects of organic movements since he believed that any reduction of such a compound processes to some simple summative system is completely unsatisfactory (Driesch 1908, p.290).

The embryologist emphasized how important is the *holistic* presentation of the phenomena of organic movement (Driesch 1908, p.291). One should add that Driesch at this point in his research still has been occupied with regulative processes although in a somewhat different sense and aspect in comparison to the one earlier accepted in the course of his research in the domain of organic morphogenesis.

Driesch has come to a conclusion that there should be “something” that is able to create respective combinations of muscle movements based on compound analysis of behavior. That is why Driesch called this *unmechanistic* factor (until then denoted conventionally only as a “something”) by means of the term “*psychoid*”. *Psychoid* was to be something analogous to his earlier concept of entelechy in this respect in which entelechy was to shape, to some extent, only the organic form of a given body; and *psychoid* was to be responsible for “behavior” of that body. In Driesch’s deepest conviction, *psychoid*, like entelechy, was also to possess the holistic-not-machine-

like character but this time it was to be already only the purely immaterial factor. Psychoid was to use some determined parts of a brain in a way similar to that in which a pianist uses respective instrument. In this sense, this is why Driesch has decidedly rejected any possibility of attributing specific functions to the brain itself.

Indeed, one might say that, according to this conception of the philosopher-researcher, entelechy as well as the psychoid were to be fitted with capabilities of creating something organic on the grounds of inorganic means. This was so since in both cases, there appears the fundamental question concerning the integrating factor which was to be responsible, on one side for compound character of organic processes and the holistically oriented development of morphogenesis and on the other side for the behavior of living organism, *i.e.* mainly for the compound combinations of organic movements.

In fact, however; Driesch's concept-construction, while coming to the term "psychoid", constituted the essential dividing line between, on one side, his early strictly scientific using of vitalistic inspirations, *e.g.* those stemming from Aristotle's philosophy, for the planning and respective developing of his biological research; and, on the other side, the very beginning of his purely philosophical speculations of a strictly metaphysical character.

The *quasi*-scientific category of psychoid, in meaning introduced by Driesch, was a kind of an attempt at further search for the specific life-parameter but this time on a strictly metaphysical ground.

Of course, there is no doubt that Driesch's deliberations in the dimension of his metaphysical vitalism presented completely dubious, and even futile, proposal from the point of view of the contemporary science and in particular from the point of view of the methodology of science.

Since I have just treated Driesch's metaphysics in quite a general way so that at the end, I shall only indicate which problem-aspects he has developed in his metaphysical vitalism in his further post-scientific parts of his endeavors, what has found its expression among others in his fundamental work *Philosophie des Organischen*: Entelechy and substance; Biology and Psychology; Problems of Individuals; Metaphysical Perspectives; Problem of Freedom; Psychology and Parapsychology.

4. Driesch on Aristotle; remarks concerning methodological differences

Although first basing his philosophy upon Plato's views, Aristotle finally freed himself from his influence especially with respect to the natural philosophy in its narrower sense. And he owned this accomplishment to his greater logical precision in analysing philosophical problems in general. Furthermore, his concept of entelechy was a combination between idea and reality which is lacking in Plato's philosophy. In this sense, Driesch *e.g.* claimed that this creation was just what the theoretical investigation of nature required (Driesch 1914, p.21).

Aristotle appears to be the main precursor of all vitalistic theories until the most recent times.

On the other hand, Aristotle's theory of life is a pure vitalism. Driesch called his theory a "primitive or naive Vitalism" for it arose from an entirely impartial contemplation of life's phenomena and not as the result of struggle against other doctrines (Driesch 1914, p.19).

Driesch emphasised that Aristotle knew quite well, stemming out of various observations, that not all embryonic parts are at once simultaneously present in the developed organism but come successively into being; and thus to use a modern term, we may call his theory an epigenetic one.

Words like "entelechy" and "dynamics" have been understood by both philosophers in a different way. By dynamics¹, Aristotle did not mean what in modern terminology, *e.g.* that of Driesch, would be called potentiality or totipotentiality² like totipotent stem cells.

Therefore, entelechy, in Aristotle's sense, is simply what "exists" in the highest sense of the word even if it was not strictly a realized thing. Thus the statue taken in this sense and before it is created, it exists in the mind of the sculptor.

Driesch, concerning Aristotle's standpoint, claimed that we can see that the concept of entelechy rather than that of dynamics corresponds, though not completely, to the modern concept of the potential (Driesch 1914, p.14).

On the other hand, Aristotle has not been conscious of how important is a relation of specified parts with respect to the whole organism.

In Driesch's opinion, there appears manifest difficulty in the fact that, as we have seen, one part of the growing body does not, according to Aristotle, condition the formation of another part, for this actually implies, to put it briefly, that the cause of the differentiation of the parts does not lie in the seed; conversely, the seed is to be regarded as a true part of the growing body (Driesch 1914, p. 14, 15).

Aristotle believed that in the case of morphogenesis there is something which forms the parts though neither directly as an identifiable entity nor yet as if the final development was already existent in it.

Morphogenesis, when taken in this sense, *i.e.* as a whole process, was rather regarded as a kind of artistic creation.

Therefore, the manner in which each part could arise should have been deduced on the grounds of the principle that everything which comes into existence, whether in nature or in art, arises *by* something actually existent, *out of* something of a similar nature and potentially existent. Now, the seed is such an object that, on the grounds of an impulse and principle, when the impulse ceases, each part comes into being and comes endowed with soul (Driesch 1914, p.15).

In this way the soul as an actuality, *i.e.* an entelechy which organizes the body. Aristotle calls the soul the principle of all living things.

Briefly, one can say that this is the main outline of the Aristotelian theory of development.

Driesch does not agree with Aristotle's claim that the question whether soul and

¹ E.g., Dynamics of the statue is already contained in the block of marble.

² Driesch himself does not use the term like this.

body are something one has as little sense as it is in the case of wax and its form. The soul cannot exist without a body, yet it is just not the body itself but rather something inherent in the body; if the eye were a living being, then eyesight would be its soul, this last being then the substance as notion or form of the eye; and the eye would be the matter of the eyesight (Driesch 1914, p.18).

Aristotle cannot start with a more subtle and logical discussion concerning the conceptions either in dynamics, entelechy and energy (Driesch 1908, pp.153–237) or of form of matter and substance (Driesch 1908, pp.238–264), and this is how Driesch did it.

Aristotle was, in Driesch's opinion, the great father of systematic philosophy, and should be regarded as the founder of theoretical biology. Moreover, he appears to be the first vitalist in history since his theoretical biology is throughout vitalistic; and it should be regarded as a very conscious vitalism indeed for it grew up in permanent opposition to the dogmatic mechanism maintained by the school of Democritus (Driesch 1908, pp.143, 144).

However, Driesch has understood the category of entelechy quite differently in comparison to Aristotle's concept. It is true that he has borrowed his terminology from Aristotle, and let that factor in life-phenomena, which he has shown to be a factor of the true autonomy of life in relation to inorganic world, to be called *Entelechy*, though, without identifying his own doctrine with what Aristotle himself meant by using the word “entelechy”. Driesch has decided to use this word only as a sign of admiration for Aristotle's great genius; this word was to be a mould which Driesch filled with new contents¹ (Driesch 1908, p.144).

In general, it seems to me that, in the case of a comparison of Aristotle's and Driesch's standpoints, we are dealing with a generally similar research method which was developed in a different way. I am inclined to claim that on one side, Aristotle has only been looking to explain the causes of organic world as based mainly on the observation of the singular organic phenomena. I think that Driesch based his vitalistic method mainly on the observation aimed at building a theoretical scheme in form of a concrete conceptual construction which was then to provide his scientific analysis.

¹ Entelechy is lacking all the characteristics of quantity. Entelechy is *order* of relation and absolutely nothing else; all the quantities concerned in its manifestation in every case were to be due only to means which are used by entelechy itself, or to material conditions which cannot be avoided.

Entelechy, though not capable of enlarging the amount of the diversity of composition of a given system, is capable of augmenting its diversity of distribution in a regulatory manner, and it does so by transforming a system of *equally distributed potentialities* into a system of *actualities* which are *unequally distributed*.

Entelechy is not energy, not forces, not intensities but entelechy. Entelechy is a factor in nature which acts teleologically. It is an intensive manifoldness, and on account of its inherent diversities it is able to augment the amount of diversity in the inorganic world as far as distribution is concerned. It acts by suspending and setting free reactions based upon potential differences regulative (e.g. enzymatic catalysis). There is nothing like it in inorganic nature. (Driesch 1908).

Conclusion

The article may stir a number of important questions which when taken in general might be concerned with the meaning of Hans Driesch's research and its most important results for the contemporary biology in some of its main branches. Those problems might concern Driesch's relevance for today as expressed in terms of philosophy of science, embryology, morphogenesis, technology (e.g., cloning), *etc.* However, were such problems discussed in the article itself, it could break the thematic unity and, above all, enormously increase the very scope of this work.

Briefly, let us take into account examples of such far reaching problems appearing out of Driesch's scientific research and conceptual analysis.

In regards to constituents of a system knowing how much substance to produce for tissues and organs, it might of course, be tied heuristically with the current thinking on tissue hormone levels that guide tissue development. But how would it be possible to even briefly present the main concepts of current thinking on tissue hormone levels?

Since Driesch has started little by little to go beyond science and into metaphysical areas by attributing extra-spatial properties to the E category, it might be considered to link this idea with the concept of Einstein's cosmological constant; but this latter concept has also had its own "ups and "downs, so would it be worthwhile to enlarge such an uncertainty by joining to it a finally ineffective biological idea?

Whether Driesch's concept of entelechy acting in space but existing outside of it might be considered as a sufficient ground for suggesting that he is a forerunner of the notion of "genes" which exist in each cell and remain intact despite regional changes? This analogy is just too risky in my opinion and it could hardly be substantiated in a sufficient way.

It might seem that Driesch's substantialist interpretation of entelechy could be contrasted in an interesting way with Bergson's energetic interpretation but Bergson's view never really caught on the strictly scientific level. So that what would Driesch's achievements be contrasted with, and how?

Driesch's concept of "organic movements" has been developed in too a general way; as a matter of fact, it embraces in many respects almost any specific organic change so that relating even simple examples of such phenomena could lead inevitably to many additional explanations.

According to Driesch's picturesque phrase, psychoid was to "use" some determined parts of the brain in a way similar to that in which "a pianist uses respective instrument". But how could it be stated and understood in strictly scientific terms? This has never been explained by Driesch himself.

Summarizing – the aim of my present remarks consist of general sketching out of the key constituents of Driesch's methodological vitalism as a overall program: how to construct appropriate conceptual means for guiding strictly scientific research and even the experimental one with respect to the specific living phenomena and to carry out this research in a form leading to the discovery of the specific laws of the organic

world, and philosophical, even metaphysical, ideas as a potential material for “coining” such specifically biological conceptual means should not be excluded.

In conclusion, we might say that Driesch’s research in the domain of biology as well as his philosophical deliberations connect tightly to his fruitful scientific activity and were very often mistakenly assessed as only pure metaphysics. Driesch’s initial endeavors have had above all a very deep and autonomous inquiring and scientific dimension. This is what I was trying to convey in the earlier part of the present paper on Driesch’s methodological vitalism.

The main reasons for the above described and essentially erroneous understanding of Driesch’s unquestionable scientific achievements as exclusively metaphysical speculations seems to stem from two fragmentary analyses of the main stages of his proper research-work.

As a matter of fact, those are only later speculative-metaphysical aspects of Driesch’s purely philosophical deliberations which nowadays are usually, and sometimes even excessively, taken into account and Driesch’s much earlier thorough although only fragmentary scientific research constituting of heuristically-methodological and epistemological stage of practicing his heuristic vitalism, either is not distinguished at all or at most it is essentially diminished as having no real scientific meaning or value.

It is no wonder that such a drastic narrowing of the perspective of analysis of Driesch’s vitalistic standpoint might in consequence bring on the exaggerated emphasizing of his *metaphysical vitalism* at the expense of his almost completely overlooked *methodological vitalism*.

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