

# MEDIUM EMERGENCE, PART THREE: THE DARWINIAN THEORY OF NATURAL SELECTION AND MICHAEL POLANYI'S THEORY OF EMERGENT EVOLUTION

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## **Abstract:**

According to Michael Polanyi's theory of emergent evolution, the Darwinian mechanism of natural selection is not the fundamental driving force of evolution, merely its primary lower-level condition. It follows that Polanyi does not reject Darwin's theory at all, it is part of his theory of emergent evolution too, he merely rejects the neo-Darwinian theory which denies even the possibility of higher-level principles in evolution. In Polanyi's view, according to the logic of emergence, both lower-level conditions (natural selection) and higher-level principles (mainly the ordering principle of life and evolution) determines the process of evolution, but the fundamental driving force of evolution is the living beings themselves that realize the ascending evolutionary achievements. This means that the essence of evolutionary emergence is nothing more but the emergence of (tacit) knowledge through the successive generations of living beings. If Polanyians do not accept his theory of emergent evolution and reject neo-Darwinism, which, unfortunately, they usually do not do, then his theory of tacit and personal knowledge will lose its meaning utterly.

## **Keywords:**

Natural selection, evolution, emergence, Charles Darwin, Michael Polanyi.

## **1. Preface: Emergent Evolution**

In the First Part of this paper, I argued that the concept of medium emergence is the proper personalist ontological theory. In the Second Part, I showed that Michael Polanyi's understanding of emergence comports with this concept and that materialism is not a valid ontological conviction.

The point of medium emergence is that emergence has two faces: there are epistemologically emergent higher-level phenomena which can be reduced synchronically at the moment to their material conditions, and there are ontologically emergent higher-level phenomena which cannot be reduced in this way because these phenomena were arisen through time according to higher-level principles. This means that the process creating higher-level ontologically emergent phenomena is nothing else but *emergent evolution*.

Emergence is a medium ontological position between dualism and materialist monism. According to dualism, which is the ontological conviction of the European Christian tradition, there are two different kinds of reality, generally described as mind/soul and matter/body which are independent, fundamental substances. It follows that man, whose essence is the mind/soul, is the creation of God.

According to emergentism, which is a new, alternative ontological position, there are also two different kinds of reality as dualism claims, but only one of them is fundamental, while the other is emergent. It follows that emergent realities are dependent on fundamental matter and have to evolve from it and so they do: *man is the achievement of emergent evolution*.

According to materialism, which has become the ontological conviction of modern European, 20th and 21st-century science, there is only one kind of reality: one fundamental substance, matter. Since in this view, there are no real higher-level realities, neither there is creation nor emergent evolution.

*See Fig. 1: The structures of the three basic ontological convictions. on p.78.*

Michael Polanyi's concept of emergent evolution is the re-established version of Samuel Alexander's concept of emergence within the *logic of achievement*. The point of this approach is that Polanyi regards living beings as active knowers that try to solve the problems they have to face during the long course of evolution, and these personal achievements of living beings are the driving force of evolution.

According to the logic of emergence that emergent realities are dependent on and thus have to rely

on lower-level processes, but they have their own higher-level principles according to which they act, the process of emergent evolution itself has lower-level, in the end, material conditions and higher-level principles. The only fundamental lower-level mechanism (condition) of emergent evolution is natural selection. In consequence, Polanyi does not reject Darwin's theory; *it is part* (lower-level condition) *of his theory of emergent evolution too*. He merely rejects the neo-Darwinian theory which, according to its materialist ontological conviction, denies even the possibility of higher-level principles of evolution.

I will show in section 2 that in this regard Darwin himself is rather on Polanyi's side than on the neo-Darwinians' one, and that evolution is either emergent evolution or there is no evolution at all. Then in section 3, I will interpret Polanyi's concept of the ordering principles of life and evolution which lead to the evolutionary emergence of life and show that the process of evolution in its essence is nothing more but the emergence of (tacit) knowledge. I hope that in section 4 it will become clear what the Polanyian view of evolution is and that if we do not accept his theory of emergent evolution and reject neo-Darwinism, then his theory of tacit and personal knowledge will lose its meaning utterly.

## **2. The Meaning of Evolution and the Darwinian Theory of Natural Selection**

Since Charles Darwin, the notions of evolution and natural selection have become widespread, but the real meanings of them are not well-known at all. Philosophers usually think that evolution is not part of their field or they simply accept the ruling neo-Darwinian view without even considering its philosophical consequences. On the other hand, biologists do not care about general philosophical questions and problems and, of course, it is not their job. Generally speaking, we have no idea how many different theories of evolution were proposed and even exist today; for example, the classical neo-Darwinism represented by, e.g., Ernest Mayr that emphasizes natural selection of individual beings; the radical gene-centric understanding of Richard Dawkins; James Lovelock's holistic Gaia-theory; or Vilmos Csányi's general theory of evolution that emphasizes the different evolutionary levels. The most notable past theories include J.-B. Lamarck's vitalistic view; Henri Bergson's notion of evolution by time; and the concept of emergent evolution from the British Emergentists. Naturally, one of these latter theories is Michel Polanyi's concept of emergent evolution, which, according to him, is the origin and source of human personal knowledge and reality.

'Evolution' is a Latin term meaning a kind of development between at least two different things/states. It is, of course, a truism; everybody knows it. Nevertheless, we do not really understand the true meaning of the notion of evolutionary development. Imagine, for example, one of our progenitors, a prokaryote that lived, even without a nucleus, over three billion years ago. Ponder for a moment. What kind of knowledge did our progenitor possess? Compare that level with ourselves. What kind of knowledge do we possess? We should then ask, what is the relationship between the knowledge our brave prokaryote progenitor possessed and our own knowledge? Whether the prokaryote had more advanced knowledge? Are we equally developed? Or we have the more advanced knowledge, in which case there is an evolutionary relationship between the prokaryote and us.

If one accepts the ruling neo-Darwinian theory perhaps he does not know but, in fact, he *denies* that we are more developed than our prokaryote progenitors. According to the neo-Darwinian theory, there is no any single *objective, explicit* criteria on the basis of which such a statement could be formulated, and other criteria cannot be acknowledged because those are 'subjective' and 'anti-scientific.' For example, the fact that humans can ride a bicycle and speak, while our prokaryote progenitor cannot, means nothing in the neo-Darwinian theory. Both our prokaryote progenitors and ourselves successfully adapted to our respective environments and possessed the skills necessary and sufficient to survive. These respective environments differ from each other so completely and randomly that the skills of our prokaryote progenitor and our knowledge are not commensurable by objective, explicit, and independent standards.

According to the neo-Darwinian theory, there is only one fundamental mechanism of evolution, the Darwinian notion of *natural selection*. It is the driving force behind the environmental adaptation of living beings. On the one hand, during inheritance, new variants are created by mutation and, at the same time, there are generally, but not necessarily, *limited environmental resources*.

See Fig. 2: *The logical structure of Darwinian notion of natural selection, on p.78*

With this mechanism, Darwin successfully explained how new life forms are created from old ones; however, he did not explain why living beings come to be more and more developed. The selective pressure on living beings is determined by the environmental resources that, in turn, ultimately depend on such contingent (random) material processes as the thermal radiation of the Sun, the inclination of the Earth's axis, or the drifting of the continents, etc. Although, these variables can be described very objectively and precisely (scientifically), they do not and *cannot* configure any developmental processes since they are entirely random. The other factor, mutations, is also random, and in most cases, it does not lead to more developed variants but, in fact, generally lead to especially weak, or even unviable, individuals. It means that over time, an adaptation process governed by natural selection can be reversed and a species might, for example, lose the ability to see or to fly, abilities that most biologists regard as the greatest achievements of evolution. Darwin himself was precisely aware of this problem and did not even use the term evolution for his theory of natural selection.

So, a process by Darwinian natural selection can be *just as likely to cause regression* as it is to cause development; 'evolution,' according to the neo-Darwinian theory is, therefore, not the developmental process anybody would at once imagine from primitive prokaryotes to, e.g., highly developed primates, but it could be the complete opposite of this, the total regression of higher life forms to primitive bacteria. This is the reason Polanyi wrote the following:

However, if we are to identify—as I am about to suggest—the presence of significant order with the operation of an ordering principle, no highly significant order can ever be said to be solely due to an accidental collocation of atoms, and we must conclude therefore that the assumption of an accidental formation of the living species is a logical muddle. It appears to be a piece of equivocation, unconsciously prompted by the urge to avoid facing the problem set to us by the fact that the universe has given birth to these curious beings, including people like ourselves. To say that this result was achieved by natural selection is entirely beside the point. Natural selection tells us only why the unfit failed to survive and not why any living beings, either fit or unfit, ever came into existence. As a solution for our problem it is logically on a par with the method of catching a lion by catching two and letting one escape. (Polanyi 1962: 35)

Polanyi formulates three essential claims in this quotation. Firstly, any significant comprehensive order—including, of course, highly orderly living beings—is the consequence of an *ordering principle*. Therefore, evolution and the emergence of life have their own ordering principles. Secondly, since natural selection is not an ordering principle but a *mechanism*, it cannot explain the process of evolution only its mechanical conditions, how, for example, environmental resources affects the composition of a population. Thirdly, natural selection in itself also *cannot* explain how living beings came into existence from inanimate primordial matter. This third claim can again be surprising at first sight because neo-Darwinians tend to pretend that the clue to explaining the origin of life lies in Darwinian natural selection alone. However, contrary to them, Darwin himself explicates the following claim in the last sentence of *The Origin of Species* when he concludes the main point of his theory of natural selection:

There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator 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. (Darwin 1872: 429)

Darwin's claim is not necessarily that God created life, but he clearly states that his theory of natural selection *does not explain the first formation of life*—as well as it does not explain the

evolution of more advanced, higher-level living beings, only the formation of new species. The Darwinian mechanism of natural selection, as we have seen, works by two factors, and one of these factors is the existence of new variants—using Darwin's word forms—that can transmit their typical features to the next generation. Since variants are naturally living beings, it means that the Darwinian theory of natural selection *presupposes life*: without any initial life forms the first factor of natural selection and, thus, natural selection itself cannot be realized. Therefore, if we accept that that fundamental mechanism of evolution is natural selection, then it will be *logically impossible*—even a logical muddle to use Polanyi's words—to explain the formation of life and the real process of evolution with the Darwinian theory of natural selection alone. This is one of the most ignored facts of modern science. Oddly enough, Neo-Darwinians go against Darwin himself by not acknowledging that other fundamental principles are needed besides natural selection to explain the emergence of life and evolution.

So, the neo-Darwinian theory of 'evolution' is not the theory of evolution. From this two different conclusions can be drawn. First, if we accept the explicit scientific dogma that the neo-Darwinian theory essentially is complete then we have to say on the one hand that life just happened randomly and on the other hand that *there is no evolution*, no one is more developed than his/her prokaryote progenitors there is no need to find further fundamental principles to explain the wonderful phenomenon of life. Second, if we insist on our personal experience that we know more and we are more developed than our prokaryote progenitors, that is, there is evolution, this means on the one hand that the neo-Darwinian theory is not complete at all and on the other one that at least one other fundamental scientific principle is needed beyond natural selection to explain the developmental process in life and perhaps another to explain the first formation of life.

Persons who accept the notion of evolution generally believe in evolutionary development and do honestly think that they are more developed than their prokaryote progenitors. Perhaps, the reason the neo-Darwinian theory seems so attractive in their eyes is that it is highly explicit, exact, uses much mathematics, is as mechanical as Newton's theory, and most of all, uses such *deceptive substitutions* by which it extremely misleads them what it, in fact, means. The most typical example is the fact that the neo-Darwinian theory is usually presented as the theory of evolution explaining our evolutionary origin and development from our primitive prokaryote progenitors, while it is, in fact, only the *theory of change*—which, moreover, rejects any personal criteria by which any real evolutionary development could be determined. Yet, the scientists and biologists who explicitly acknowledge the neo-Darwinian theory believe in evolution very much; *tacitly they understand from the neo-Darwinian 'theory of evolution' what evolution really means*. The fact that the neo-Darwinian theory itself does not explain any evolution at all will be clear only through a detailed and explicit analysis of the theory and the tacit motivation of the neo-Darwinians.

So, what does the notion of evolution really mean? What kind of criteria does a process need to correspond to in order to be considered a process of evolution? For now, let's think over: is it possible to find a living being more developed than another using only the objective, entirely explicit, exact criteria employed by the neo-Darwinians? This is a philosophical question, and my answer is no. *There are no such perfectly objective, explicit, exact criteria by which we can consider our own knowledge more developed than that of our prokaryote progenitors*.

The other, ontological side of the problem is that on the material level, there are no essential differences between the material structure of a prokaryote and a man. Both of them have their own DNA which determines the other material structures they are comprised of, and in both cases, the actual structure of that DNA resulted from the process of natural selection. We can precisely specify the base sequences of DNA and, therefore, can assign them perfectly exact numerical parameters, but by what criteria is it possible to decide which sequence of numerical parameters is more developed than the other? There are no such criteria. The array of 13012321322231 . . . where each explicit number represents a nucleotide base is not more advanced than the array of 23123011212313 . . . This is the reason that, according to the neo-Darwinian theory, it cannot be stated that we are more developed than our prokaryote progenitors; that would be an ungrounded, 'unscientific,' anthropomorphic statement.

However, we see ourselves as being more developed, not because of any explicit numerical parameter or as a result of our specific material structure, but because *we possess such personal*

knowledge both biological and cultural which essentially transcends the poor knowledge of our prokaryote progenitors. We see ourselves more developed because we can ride a bicycle, we can speak, we have culture, and we practice science. This is the reason that our personal reality is much deeper than a prokaryote. We know this. But this knowledge cannot be defined by perfectly exact, objective parameters in the same way we can represent the base sequence of DNA, so the neo-Darwinian theory following the objectivist ideal of modern science simply *ignores* these facts.

We can find the criteria and the additional principles of evolutionary development, not in the material structures of living beings and in the exact parameters of those structures, but in the *biological* reality of living beings and *cultural* reality of man, that is, in our personal knowledge and in our personal reality. Evolution is not only successful adaptation by natural selection to the environment to survive and reproduce *but the emergence of life from inanimate matter to gradually possess more and more advanced knowledge*. The most primitive ancient prokaryote can sustain its metabolism and can reproduce. Development does not stop at this ancient tacit level but goes on to reach the specified skills of multicellular beings, the amazing abilities of primates, and, eventually, to the articulated knowledge of man encompassing, for example, man's cultivation of the science of evolution as a theoretical framework in which we may understand both our past and our future opportunities. Every major transition is unprecedented and creates new levels of knowledge comprised of their own principles and actions, which are essentially different from the previous ones. This is the reason that there are no equally valid and applicable laws and methods for every level; biology is not physics.

It means that there is *emergent evolution* or there is *no evolution at all*. Natural selection is only the fundamental mechanism and condition of the emergence of more and more developed living beings that possess more and more knowledge to survive and reproduce.

Darwinism has diverted attention for a century from the descent of man by investigating the conditions of evolution and overlooking its action. Evolution can be understood only as a feat of emergence. (Polanyi 1962: 390)

Polanyi's statement is a clear philosophical principle. However, natural scientists are reluctant to face it because it is considered 'frivolous' and 'non-scientific,' but the real reason they try to reject it is that it contradicts their *materialist philosophical commitment*, whether it be explicitly pronounced or just tacitly believed and concealed. In consequence, although their theory explicitly excludes even the possibility of evolution and enables only a theory of change, they are still speaking about evolution and, in explicit contradiction with their materialist conviction, they often tacitly mean what they say. This contradiction, deeply rooted in today's science, is one of the cases of the intellectual forms of moral inversion. (Polanyi 1962: 233)

Nevertheless, the philosophical situation is clear concerning the concept of evolution. If materialism is true or at least a person who believes it to be true can *consistently* speak solely about change by natural selection at the material level exactly in the same way as a chemist discusses how the movements of the molecules change in a gas due to rising temperature and not as we speak about the development of living beings. However, if emergentism is true, then there is a possibility that life emerges from primordial inanimate matter and the evolutionary development of knowledge starts culminating later in the emergence of human culture and human souls. It is the real meaning of the notion of evolution, and those who truly believe in evolution understand it, at least tacitly, in this way.

Now the question is what the ordering principles of the formation of life and evolution are because natural selection, according to the logic of emergence, is only the fundamental mechanism and condition of evolution. But first I would like to double back shortly to a problem we explored earlier. For neo-Darwinians, the first formulation of life was an instantaneous random event. Moreover, it has often been emphasized that even 'evolutionary development' itself is a random process driven by random mutations and natural selection. With this example, I would also like to shed light on why they believe in this falsity.

In his book, *The God Delusion*, perhaps the most well-known, neo-Darwinian biologist, Richard Dawkins depicts a telling metaphor of how life started according to neo-Darwinism. (Dawkins 2008: 137) He uses the legendary aphorism of Fred Hoyle who argued against the neo-Darwinist concept of

the origin of life. Imagine a junkyard where every part necessary to building an operable Boeing 747 can be found. Then imagine a hurricane that sweeps through that junkyard and leaves an aeroplane ready to fly. According to Fred Hoyle, the likelihood that life could emerge through a random lightning strike into the so-called primordial soup—where, of course, every necessary ingredient for life (water, sunlight, favourable temperatures and pH balances, amino acids, etc.) were also could be found—was *even smaller* than the likelihood for an operable Boeing to be assembled during a hurricane out of some leftover junk. Dawkins still claims that as unlikely as it may be, this is precisely what happened and how life originated. The argument stands that there was so much time and the never-ending primordial soup was so vast that it still just happened without any divine intervention.

Now it seems that this problem is all about chance: what is the probability for the creation of life by a random event and was there enough time to realize such a small probability or not. And if this is true, then the secret of the origin of life can be solved by very exact probability calculations all we need is 'highly advanced' and explicit mathematics such as the Drake-equation used to calculate the probability of life on other planets. My claim is that this problem is not about chance at all. A real scientific answer *has to be based on empirical evidence and scientific principles* and not on chances. The only result of the very exact and scientific probability calculations is the concealing of the real nature of the problem, just as the use of the term 'evolution' conceals the fact that the neo-Darwinian theory is not about evolution at all.

The real nature of the problem is: Do we really think that it is possible for an operable Boeing 747 to be created instantaneously from junk by a random hurricane? Similarly, do we really believe that it is possible that a viable living being can be created instantaneously only by a random material event? If this is the case, then you can start calculating the probabilities. But if not, the calculations are meaningless.

My claim is that on the basis of hard *empirical evidence*, we have to say that *it is not possible*. Hurricanes and lightning destroy structured things; they do not create them. Everyone has seen evidence of this little simple fact because nobody has ever observed lightning create houses instead of destroying them, and nobody ever will because the nature of random material processes is that over time they break down every comprehensive order. This phenomenon, of course, corresponds entirely to the physical principle that the entropy (the lack of order on the fundamental level) of a system is necessarily growing until an *ordering principle* changes the process; for example, due to an external and stable energy flow, some kind of new structure starts to grow in the system.

So, my explicit claim that the *nature* of random material processes ensures that over time every comprehensive order is broken down is based on the conviction that, in reality, it is simply *impossible* that a random hurricane can create a Boeing 747. It is not the question of chance and, thus, a matter of making exact probability calculations to explain how life was formed at the beginning, but instead, it is our conceptualization of the *principles* of the process *on the basis of our natural human and scientific experiences of this kind of processes*.

It is necessary only due to logic that there is a possibility for a random hurricane to create a Boeing 747. As it is also necessary only due to logic that if I jump out the window, then there is a possibility that I will fly. Logic, however, is not reality. In reality, it is a question of empirical evidence and not logical possibilities. Therefore, if we set aside the empirical evidence and immediately attempt to answer the question by chances and probability calculations, then, in reality, we do nothing else just making the impossible possible. With a deceptive magic trick, we substitute the logical possibility into the place of an impossibility of reality. Or to be harsh, thanks to the magic of numbers and to the so exact and scientific probability calculations, we start to believe in the magical power of random winds and lightning—or random mutations. And since any lightning, wind, or genetic mutation in the DNA are strictly deterministic physical process, even the meaning of our words 'random mutation' becomes blurry. (Paksi 2015)

So, the question is: Why do Dawkins and the neo-Darwinians so 'scientifically' look over the empirical evidence and deal with the problem as a question of chances and probability calculations? And why do we tend to believe them?

First, in their eyes, this approach of exact probability calculations due to the Laplacian ideal of objective knowledge is far more scientific than to ask what we believe based on our natural human experiences and personal facts.

Second, starting in the 1960s, experimenters have attempted to recreate life in the laboratory from non-living chemicals by random events, for example, by random electric discharges. But no matter how many times they tried, the experiments always failed. It is serious scientific evidence against the neo-Darwinian concept; however, they look over it by claiming 'it has not yet succeeded, but it does not matter because the next experiment might.'

Third, most importantly, they think in a *false dichotomy*. They say that there are two options: creation by a Higher Intelligence or creation by a random material process. God or randomness, there is no third option. It means that every other explanation easily becomes God himself which, of course, cannot be accepted in scientific discourse. It is also the reason that the hard empirical evidences of failed experiments to recreate life do not matter because if these negative results would be really accurate (which they are, of course) that would mean in their eyes that life was created by God; and that is obviously not possible, so the negative results of the experiments have to be false.

But ponder a moment, what is the real difference between *God as a magical factor* that cannot be scientifically observed and examined and between a supposed, once happened *mysterious random event* that cannot be repeated? Which, by the way, also means that it cannot be scientifically observed and examined. The picture of a random lightning bolt striking down from the sky and creating life or the image of a random, mysterious hurricane sweeping through a junkyard and leaving an operable Boeing 747 ready to fly, eloquently portrays the logic and real meaning of the neo-Darwinian concept regarding the origin of life. Logically, due to the dichotomy, it is precisely the same as God breathing the secret power of life down from the skies. Only they do not worship God but the demon of Laplace.

Finally, as we have seen, and this is the real point, they have materialist philosophical conviction. According to dualist creationism, life and man were created by God; according to materialist neo-Darwinism, life and man were created by random material processes, the mystical first event, mutations, and the mechanism of natural selection; and according to emergentism, life and man were the achievements of emergent evolution, which means both the workings of mutations and natural selection as well as the free acts of living beings according to the ordering principles of life and evolution. It is the reason that I dare to say that emergentism alone conveys the true meaning of evolution.

In most cases, in *Personal Knowledge* Polanyi speaks about plainly Darwinism. It turns out only from the context that to which kind or level of Darwinism he exactly refers. Nonetheless, to understand his critique it is enough to see and always remember the above fundamental difference between Darwinism and neo-Darwinism and, in consequence, when he harshly argues against explanations by random genetic mutations, or he states that the theory of natural selection as a lonely fundamental mechanism cannot explain any real comprehensive evolutionary orderly phenomena of nature, he, in fact, does not even contradict Darwin, because Darwin himself never claimed these things.

So, if we do not identify Darwinism with neo-Darwinism as neo-Darwinians do for obvious reasons, then Polanyi could and *should be* regarded as a Darwinian because in the limited original sense he completely acknowledges Darwin's theory of natural selection. Moreover, I dare to say that he is more faithful to the original spirit of Darwin's work because Darwin did not close the questions about, for example, the comprehensive orderly phenomena of evolution and its ordering principles as neo-Darwinism did due to the philosophical beliefs of materialism and positivism. Of course, Darwin was not an emergentist, but he was not a materialist too. I believe that he did not know yet what to think about these fundamental questions and left the door open.

### **3. The Meaning of Emergence and the Ordering Principles of Life and Evolution According to Michael Polanyi**

We have seen in the previous section that the evolutionary development and the origin of life cannot be explained only by the lower-level mechanism of natural selection; we need further principles. Polanyi as an emergentist states the followings about the ordering principle of life:

It is clear that for such an event [the first formation of life] to take place two things must be assured: (1) Living beings must be possible, i.e. there must exist rational principles, the operation of which can sustain their carriers indefinitely; and (2) favourable

conditions must arise for initiating these operations and sustaining them. In this sense I shall acknowledge that the ordering principle which originated life is the potentiality of a stable open system; while the inanimate matter on which life feeds is merely a condition which sustains life, and the accidental configuration of matter from which life had started had merely released the operations of life. (Polanyi 1962: 383-384)

Life is the precondition of evolution; and the formation of life from inanimate matter, according to Polanyi, has two preconditions:

First, *living beings have to be possible*. This means, according to the logic of emergence, that if living beings come to existence, then beside the necessary lower-level material conditions *there will be such higher-level rational principles* (rules of rightness) *the operation of which can sustain these living beings*. Living beings are not material; their (tacit) knowledge works in accordance with these higher-level principles.

Second, favourable material conditions have to be formed. This means that if this happens, then these favourable lower-level conditions, according to the logic of emergence, will initiate and then sustain the operation of those higher-level rational principles which, in turn, sustain the living beings that have come to existence during the process.

It follows that 'the *ordering principle* which *originated* life is the potentiality of a *stable open system*.' Life itself is a stable open system. It has (1) emergent *knowledge* (skills) which works due to higher-level rational principles and (2) fundamental *material conditions*.

Before the first formation of life, there were no living beings merely the primordial material conditions and their random fluctuations in space-time. These material conditions and their random fluctuations, however, in themselves cannot initiate the formation of life. As a matter of fact, in themselves, the fluctuations of the material conditions are entirely deterministic because they can be said to be random only in relation with other levels as it is the case with mutations in the process of evolution (Paksi 2015). In an entirely material world, as materialism conceives it, *there is no randomness, and there is no potentiality*. In such a world, there are merely the mechanical processes of the fundamental material substance and, in consequence, there is no possibility for the emergence of life at all: living beings are just not possible.

It follows that the first precondition of the emergence of life—i.e., living beings have to be possible—is not a vacant logical necessity without any existential meaning, namely that if they are going to exist, then they will simply have to be possible. As just the first formation of life is not merely a question of chance and exact probability calculations about random material processes. The first precondition of the emergence of life is about the true hidden nature of reality. Before the emergence of life, that is, in a material world, according to the real nature of reality, there was already possible that certain favourable material conditions could be formed over time which would initiate the operation of higher-level rational principles and the formation of life. This concept describes the real material world already emerged from space-time during the so-called Big Bang and Cosmological Inflation but still before the emergence of life and not the false concept of materialism.

So, the origin of life is a *potentiality*: life is the consequence of this potentiality by time. The origin of life is not randomness or a logical necessity. It is not a material process or a vital substance. *Life is a possible new, emergent aspect of reality which arises from the randomness of fundamental material conditions according to the logic of emergence*.

In the ontological sense, before the emergence of life, actually there is merely the primordial inanimate matter in space-time; but potentially there is life itself because matter is only one aspect of reality. This is the meaning—or more precisely one of the primary meanings—of emergence: reality is more than the fundamental material substance but what is more is not another substance. Reality is more than matter because it has emergent aspects too. Space-time itself is the emergent aspect of reality and emergence is not a substantial process because it is a process by time. (Alexander 1920) This is the reason that the reduction of life cannot be done synchronically only in space at the moment but diachronically in time (see Part One and Two) because any emergence happens in/by time. Even the emergence of matter at the beginnings happened in/by time. At the time of the Big Bang there was no matter yet. However, this is another problem with which I cannot deal here.

Nevertheless, we can say more than the origin of life is a potentiality by time because it is the



nature of emergence that every process of emergence has its own lower-level conditions. According to the second precondition of the emergence of life, also favourable lower-level material conditions have to be formed for the emergence of life. This means that *before* the emergence of life, the potential ordering principle of life is actually nothing more in space-time but a *favourable order of material conditions* which by time as a possibility-condition initiated the emergence of life. This potentiality of the real, emergent nature of reality and these favourable material conditions *together* lead to the first formation of the stable open systems of life.

Although the ordering principle of life is not an independent ontological existent before the emergence of life just a potentiality in a specific order of matter, *still cannot be identified* with the fundamental material substance. In this epistemological sense, no order of matter can be identified with matter itself. The (synchronic) reduction and thus the ontological elimination of the higher level, of course, in this case, can be done, but the reduced higher-level epistemic phenomenon of the specific order of matter is the precondition of the reduction process, therefore, cannot be eliminated (Part Two). This means that any favourable order of material conditions initiating the emergence of life is an *epistemologically emergent* phenomenon of the higher level, *a new space* created by this favourable order of material conditions in which the emergence of life can take place by time according to the logic of emergence.

*See Fig. 3: The structure of epistemologically emergent phenomena on p. 78*

So, the conclusion is this: the ordering principle of life is certain, in the epistemological sense emergent comprehensive order of the fundamental material substance which by time as a new kind of space due to the logic of emergence initiates the realization of the possibility of life. The favourable comprehensive order, as I called it in Part One, is one of the two faces of emergence. This emergence originated life, that is, such stable open living systems which, in turn, are emergent in the ontological sense. This means that by time the weaker face of emergence initiated the emergence of the other, stronger face. This is the point and real meaning of emergence: reality unfolds its different aspects by time.

I have spoken of the philosophical meaning of the ordering principle of life. There are many details mainly concerning the material conditions about which it can also be talked and science, of course; however, my goal in this paper is to turn back to the problem of evolution: so, what the ordering principle of evolution is according to Polanyi? He continues the above quotation in the following way:

And evolution, like life itself, will then be said to have been *originated* by the *action* of an ordering principle, an action *released* by random fluctuations and *sustained* by fortunate *environmental conditions*. (Polanyi 1962: 394)

He does not say much just indicates that the point of the process is the same. (1) First of all, evolution has to be possible. (2) Second, favourable random fluctuations of material conditions have to happen. (3) Third, favourable environmental conditions have to be formed. Then we can say that evolution is originated by the action of an ordering principle, and this ordering principle of evolution is the *potentiality of the evolutionary emergence* of stable open systems.

The most significant difference stems from the fact that before the emergence of life, there was only the primordial inanimate matter in space-time, but before the evolution of life, life itself was also already there: life is an emergent aspect of reality and the subject of evolutionary emergence. The presence of life is the reason that in this case the two different aspects of the second precondition of the emergence of life—here the second and third preconditions of the process—can be easily isolated.

To better understand the process I quote Polanyi once more: 'Novel forms of existence take control of the system by a process of *maturation*.' (Polanyi 1962: 395) Novel forms of existence mean the higher and higher levels of emergent knowledge of living beings by which they act according to higher and higher-level rational principles: for example, 'face the direction of the wind while you are approaching the prey.' The system about which Polanyi talks is the evolutionary system of the whole evolutionary process.

So, evolution has to be possible, that is, (1) there must be *life* and (2) there must be an *evolutionary system* which provides the needed space and energy flow (resources) for the evolution of life. Actually, this means nothing more than at the beginnings such random fluctuations of material conditions happened in a nebula which led to the formation of the stable open evolutionary system of Earth in the Solar System. Shortly afterward the action of the ordering principle of evolution was 'released by random fluctuations and sustained by fortunate *environmental conditions*.' This means that for the evolution of life: (1) favourable random fluctuations have to happen in the material conditions of the body (space) of living beings; (2) favourable environmental conditions have to persist during the process outside (in the outside space of) the body of living beings. The first leads to the creation of *variants* by mutations which can be the subject of evolutionary emergence and the second to such *environmental resources* which, on the one hand, sustain life and, on the other hand, limit the acts of living beings. These are, of course, the factors of natural selection identified by Darwin so well, but these only 'released' and 'sustained' the action of the ordering principle of evolution and nothing more. Now, the question is what this ordering principle is the action of which was 'released' and 'sustained' by the factors of natural selection?

The answer is that this ordering principle is nothing else than the evolutionary system itself, that is, the Earth. It is a stable open system, in the epistemological sense emergent comprehensive order of the fundamental material substance which due to the logic of emergence initiates the evolutionary emergence of life, that is, initiates the realization of the possibility of evolutionary emergence in living beings.

Earth has the potentiality for evolutionary emergence, and by time this process has been realized. Life is the part of Earth. At the beginnings only a small part of it. Life is an emergent existent in the ontological sense which spreads and develops. Therefore, evolutionary emergence is the maturation process of Earth by which an epistemologically emergent stable open system becomes more and more emergent in the ontological sense. 'Novel forms of existence take control of the system' by their higher and higher levels of emergent knowledge as information accumulates in the genomes of living beings. This is the way in this case too as reality unfolds its different aspects by time in the specific spaces of the evolutionary system of Earth.

#### **4. The Meaning of Emergent Evolution: Personal Knowledge and Natural Selection**

Living beings develop their specific structures, fixed functions during ontogeny. This is one of their definite goals. The process complies with the logic of achievement, and it is controlled by the centre of the organism due to its coded knowledge. This process via generations and generations of living beings—called phylogeny—and at the higher level of the evolutionary system appears as the gradual organizations ('maturation') of the whole system. The process of phylogeny, of course, also complies with the logic of achievement; however, contrary to ontogeny, it is not controlled by a definite centre due to pre-coded information but by the limited resources and energy source of the system through its basic mechanism called natural selection.

It is a fundamental property of open systems, not described before now, that they stabilize any improbable event which serves to elicit them. R. A. Fisher's observation of the way in which natural selection makes the improbable probable is but a particular application of this theorem. (Polanyi 1962: 384)

This means that open systems as higher-level ordering principles can regulate and harness the lower-level random processes. In the case of evolutionary systems, this action is realised via, of course, the Darwinian mechanism of natural selection.

Now, the questions are these: (1) how an epistemologically emergent order of material conditions, that is, the limited resources and the energy source (primarily the heat of the Sun, of course) of the evolutionary system can initiate and sustain the evolutionary emergence of life; (2) why the mechanism of natural selection does not describe this process; and (3) what the meaning of the claim is that the main driving force of selection is the heuristic efforts/achievements of individual living beings?

According to Polanyi, the most obvious facts of emergent evolution are the deepening of sentience

and the rise of thought, but these specific facts of natural human experience can become scientific facts if and *only* if we accept the concept of personal facts on the basis of the theory of personal knowledge. Otherwise, by explicit, objective criteria these are just naïve, subjective impressions. However, by these facts and only by these personal facts 'we can acknowledge that certain lines of evolution have been more effective than others.' (Polanyi 1962: 384) As we have seen in section 2, without these personal facts, we cannot speak about any real evolution, and the term itself will lose its original meaning and become a deceptive substitution. Nonetheless, in reality, we do not really care about the severe lack of exact scientific criteria but inevitably accept our natural, tacit convictions determined by these personal facts that we know more than our prokaryote progenitors; for example, contrary to them, we have eyes and can see.

It is trivia from the days of Lamarck and Darwin that these comprehensive achievements of evolution like the formation of the eye cannot be observed within a short period of time; however, it is a far more important fact that along with these crucial but rare evolutionary achievements thousands and thousands of other, random processes take place simultaneously which by their pure numbers could easily conceal these real evolutionary achievements from the eyes of the biologists. Nevertheless, the scientific observation of these random phenomena based on lower-level and quite exact criteria is, of course, not in the least unnecessary because these random processes are the direct possibility-conditions of every real comprehensive evolutionary achievement. For example, in this way geneticists have achieved wonderful successes analyzing the diverse and random conditions of evolution in the past decades, but in the meantime they, unfortunately, have ignored the sparse but real evolutionary achievements which are not merely the consequences of lower-level random processes, i.e., mutations but the actions of living beings according to different ordering principles. This means in respects to the theory of natural selection the following:

. . . the theory of natural selection, by subsuming all evolutionary progress under the heading of adaptation as defined by differential reproductive advantage, necessarily overlooks the fact that the consecutive steps of a long-range evolutionary progress—like the rise of human consciousness—cannot be determined merely by their adaptive advantage, since these advantages can form part of such progress only in so far as they prove adaptive in a peculiar way, namely on the lines of a continuous ascending evolutionary achievement. The action of the ordering principle underlying such a persistent creative trend is necessarily overlooked or denied by the theory of natural selection, since it cannot be accounted for in terms of accidental mutation plus natural selection. (Polanyi 1962: 385)

The Darwinian theory of natural selection regards *every* process of selection as an *adaptation*. Even if a species loses its eye, as it happened with several species that now live underground, which is an apparent regression, of course, yet, this process of regression is also regarded as an adaptation to the actual environment. Nevertheless, the process of evolution is adaptive not merely in this narrow sense but *also in the sense of comprehensive evolutionary achievements*. For example, the formation of defensive coloration in a species, e.g., the green skin colour of the European tree frog can indeed be explained only by mutation and natural selection, since it is not under the control of higher-level ordering principles, and it does not lead to further, higher-level skills and knowledge, consequently, it is not a comprehensive evolutionary achievement, only an occasional adaptation to a random, local environment. However, this cannot be stated about the formation of the learning skills of mammals or about the development of the human mind which all established genuinely new higher evolutionary levels.

The point is that only those kinds of adaptations lead to evolutionary emergence which are under the control of higher-level principles and correspond to the logic of achievements in regards to the comprehensive evolutionary system, while other kinds of adaptations only by natural selection which do not meet these criteria do not. The ordering principle of evolution is not present or, more exactly, is not realized in every process of the evolutionary system, while the mechanisms of mutation and natural selection in themselves as conditions only 'release' and 'sustain' the actions of higher-level ordering principles. This is the reason Polanyi says that 'Darwinism has diverted attention for a

century from the descent of man by investigating the conditions of evolution and overlooking its action.' (Polanyi 1962: 390)

Polanyi calls the process which leads from the first primitive prokaryotes via so many generations to an actual living man *anthropogenesis*. This process is a clear chain of particular living beings—which because of sexuality diverged at higher levels but at the asexual beginnings was entirely linear,—and it has nothing to do with actually living peoples or with other different species of the past, the formation of which was explained by Darwin so successfully. From the viewpoint of evolutionary emergence, it does not matter at all that our thirty-thousandth great-grandfather was already a Homo Sapiens or still a Homo Erectus or whether he had a brother whose offspring later became Homo Neanderthals or had not. In regards to a particular process of evolutionary emergence, the examination of every side branch—there are and were billions of them!—of that particular descent, which realized the given evolutionary achievement in question, merely distracts the attention of the biologist from the real comprehensive evolutionary achievement.

Therefore, real evolutionary achievements are not about species or concrete living beings and certainly not about mutations and side branches of these mutations but about a comprehensive accumulation of 'novel forms of existence,' which gradually take control of the evolutionary system and which are decoded in the continuously surviving genome as (functional) information. This means that the foundation of real evolutionary emergence is nothing more but the continuous accumulation of information in the genome—later in human culture—which are adaptive in the sense of comprehensive achievements. However, since information (like randomness) is a relational phenomenon, it means nothing without living beings which use and apply this information. A lonely DNA in itself means nothing. It functions as coded knowledge only in the bodies of living beings. Consequently, *evolutionary emergence is, in fact, the continuous accumulation of the tacit knowledge and personal reality* of living beings developed from this coded information in each generation. By this tacit knowledge, we can solve problems, control our body, and harness our environment. By this knowledge, we can see, for example.

Now, we can understand the further deficiencies of natural selection and its real role in evolutionary emergence; nonetheless, we still have to precisely answer the central question that how an epistemologically emergent order of material conditions as an ordering principle can initiate the evolutionary emergence of life. Actually, this is the primary problem which always entails the accusation of vitalism even in the inner circle of the so-called Polanyian thinkers. For example, Philip Clayton expressed his opinion concerning this question at one of the events of the American Polanyi Society, and then he wrote in his book the followings:

The causal powers of non-existent (or at least not-yet-existent) objects make for suspicious enough philosophy; they make for even worse science . . . The doctrine of vitalism that Polanyi took over from Driesch meant, in fact, a whole-scale break with the neo-Darwinian synthesis, on which all actual empirical work in biology today is based. (Clayton 2004: 21)

Yes, Polanyi used Driesch's concrete results but did not take over his conceptual and explanatory framework at all. These are different things. Nevertheless, in the eyes of the neo-Darwinians using scientific data which are against their theory is usually and unfortunately regarded as vitalism which, in fact, means 'bad' and 'unacceptable' science. Also, most of the actual empirical works in biology are not based on the neo-Darwinian theory, *only understood and explained* within this framework—which, in reality, is not needed at all to observe and classify the deceptive colours of different species or to identify and analyze the DNA sequences of a concrete living being. These various scientific examinations and their results can also be done and explained in the conceptual and explanatory framework of emergent evolution.

To answer our main question that how an epistemologically emergent order of material conditions can initiate and sustain the evolutionary emergence of life, Polanyi tries to elude the false dualism vs. materialism dichotomy, according to which, during the major transitions of emergent evolution either (1) a new, creative agent determined the process over and over again, that is, a vital force or a Higher Intelligence, or (2) the whole process was determined mechanically by fundamental material

conditions which, in consequence, as a kind of synchronic reduction would eliminate the real achievements of living beings thus at the end emergent evolution and living beings themselves.

In Polanyi's definition during the maturation of the evolutionary system, two different types of determining factors work: an *a fronte* and an *a tergo* types of determinism.

We shall have to reconsider the concept of maturation in order to reconcile these alternatives. The argument will fall into two parts, the first dealing with determinism *a fronte* by the universal target of a commitment, the other with determinism *a tergo* by the bodily mechanism of the person entering on a commitment. (Polanyi 1962: 395)

The *a tergo* determinism is the mechanical effect of the lower-level material conditions which release and sustain the higher-level processes of life. These are necessary conditions for evolutionary emergence, but cannot and do not determine the active, dynamic acts of living beings entirely. They can be pictured as conditions which anchor the acts of living beings from behind.

The *a fronte* determinism is defined by a goal, and it works according to the logic of achievement. The terrestrial environment, which surrounds living beings and provides the necessary resources for them, is a stable open evolutionary system. This means that it incorporates many different kinds of comprehensive orders at many different levels both in the epistemological and in the ontological sense. The proper *recognition* of these different kinds of orders, the correct *solution* of the problems which stem from the situations created by these orders, and the *utilization of the opportunities* arising from these situations and orders are all fundamental and necessary goals of living beings if they want to survive, if they want offspring. It is the question of success or failure, life or death that a prey in a particular situation recognizes a comprehensive emergent order as a lion or as tall grass ruffled by the wind. *These acts of living beings are not merely mechanical processes or the consequences of some vital force but real achievements by the tacit skills and knowledge of living beings.* They have to use their knowledge to be able to solve the problems they have to face.

We may say that the animal has seen a problem, if its perplexity lasts for some time and it is clearly trying to find a solution to the situation which puzzles it. In doing so, the animal is searching for a hidden aspect of the situation, the existence of which it surmises, and for the finding or achieving of which the manifest features of the situation serve it as tentative clues or instruments.

To see a problem is a definite addition to knowledge, as much as it is to see a tree, or to see a mathematical proof—or a joke. It is a surmise which can be true or false, depending on whether the hidden possibilities of which it assumes the existence do actually exist or not. To recognize a problem which can be solved and is worth solving is in fact a discovery in its own right. (Polanyi 1962: 120)

These acts of problem-solving in some instances could become the dynamic adaptation of living beings to the terrestrial environment in the sense of comprehensive evolutionary achievements. However, many acts of problem-solving are, of course, only simple routine activities, or merely lead to adaptations to the accidental local conditions which in themselves do not evoke genuinely new skills and knowledge in the given living being but only new kinds of application of the existing ones (side branches of evolutionary emergence). If there are no hidden rational relationships in the comprehensive orders of the evolutionary system, then there will be no genuinely new opportunities, the recognition and utilization of which, according to higher-level ordering principles, could evoke genuinely new skills and knowledge in living beings. However, the point of the comprehensive evolutionary system is that due to its highly complex nature there are enormous numbers of hidden relationships in its different spaces which are rational because they can be recognized, solved, and utilized. For example, by the help of a rod, a chimpanzee can reach the termites through the heat dissipation holes of the termite mound which is the acquiring of a new skill and a primitive example of tool use. However, my point is that these kinds of new skills/knowledge are such adaptive achievements which can trigger real evolutionary emergences by their unforeseeable new opportunities as it was happened with the *Homo habilis*, for instance.

In this sense Polanyi claims that rational problems (and minds) are more real than tangible cobblestones:

Persons and problems are felt to be more profound, because we expect them yet to reveal themselves in unexpected ways in the future, while cobblestones evoke no such expectation. This capacity of a thing to reveal itself in unexpected ways in the future I attribute to the fact that the thing observed is an aspect of a reality, possessing a significance that is not exhausted by our conception of any single aspect of it. To trust that a thing we know is real is, in this sense, to feel that it has the independence and power for manifesting itself in yet unthought of ways in the future. I shall say, accordingly, that minds and problems possess a deeper reality than cobblestones, although cobblestones are admittedly more real in the sense of being tangible. And since I regard the significance of a thing as more important than its tangibility, I shall say that minds and problems are more real than cobblestones. (Polanyi 1967: 32-3)

For Polanyi, according to the concept of emergence, reality is not just strict substance and tangibility but the constantly unfolding rational aspects of reality too. Cobblestones usually are not going to surprise us and face us with new problems. But the higher-level, functional relations, interactions, and connection of our evolutionary system as they are unfolding during the long course of evolution will do. At a higher intellectual level, a problem could be a vital anticipation of a significant rational relations, for example, a prescience of a fundamental physical law in exact sciences, but animals also have to solve problems, for example, to recognize and evade a well-placed trap or to find a way to reach the prey in the swamp. Problem-solving in all cases means *the proper recognition and understanding of the different comprehensive features of the evolutionary system*,—of course, for all living beings at its own intellectual level. When living beings solve problems, they do it for the reason to adapt to their environment, and this leads them to the *better understanding* of the evolutionary system at their own level of personhood, of course, as it is important to emphasize again and again. This means two things.

First, living beings reach *deeper contact with reality* manifesting itself in the comprehensive features of the evolutionary system. This deeper/new contact can be described as the accumulation of information in the system.

We have seen already that whenever we make (or believe we have made) contact with reality, we anticipate an indeterminate range of unexpected future confirmations of our knowledge derived from this contact. The interpretative framework of the educated mind is ever ready to meet somewhat novel experiences, and to deal with them in a somewhat novel manner. In this sense all life is endowed with originality and originality of a higher order is but a magnified form of a universal biological adaptivity. But genius makes contact with reality on an exceptionally wide range: seeing problems and reaching out to hidden possibilities for solving them, far beyond the anticipatory powers of current conceptions. (Polanyi 1962: 124)

Polanyi speaks about us as living beings, more precisely, about the genius, but he makes clear that the wonderful acts of a genius are only one kind of the many other kinds of achievements of 'a magnified form of a universal biological adaptivity' like, for example, a cat's new adaptive skill to stalk its prey. We are all living beings, we possess the same ancient tacit skills, and our ultimate motivations are also the same.

Second, the ordering principle of evolution (that is, a stable open evolutionary system) provides a continuously unfolding *space* and *direction* for the achievements of living beings in a way that cannot be described as a direct mechanical or vital effect. Therefore, the ordering principle of evolution is indeed only the *possibility* of evolutionary emergence: in itself it cannot cause any acts of living beings and thus the process of evolutionary emergence because it is not an independent/substantial reality like a vital force or a Higher Intelligence, 'only' the sum of the various, unfolding spaces of the comprehensive emergent orders of the terrestrial environment (partly in the epistemological and partly

in the ontological sense). It follows that living beings *themselves* by their active, dynamic nature have to recognize, utilize, and occupy these spaces and thus realize the possible further comprehensive evolutionary achievements.

Nevertheless, in living beings there works an aspiration, an active, emergent principle, the actual manifestation of the principle of life which spurs them to explore and understand the comprehensive emergent phenomena of the evolutionary system, to solve the problems they have to face, and to utilize the possible opportunities; this drives evolution from inside, and nothing causes it from outside.

At the basic level of replication of primitive prokaryotes, where there is no real ontogeny during reproduction yet, comprehensive evolutionary achievements can happen only in the sense of *phylogenetic emergence*—which is called by Polanyi the highest ‘stage of originality.’ (Polanyi 1962: 399) Primitive prokaryotes can face and solve problems only indirectly due to their coded knowledge at their most primitive level of personhood. Accordingly, a fortunate mutation could lead to such new acts and individual achievements in the life of the primitive prokaryote which at the level of the evolutionary system appear as indirect solutions and utilizations of rational problems; therefore, these fortunate mutations could initiate and sustain real comprehensive evolutionary achievements. So, the active knowledge of the primitive prokaryote refers to the comprehensive features of the system only indirectly through the evolutionary process thus it can be described only at the higher level of the system.

At higher levels of reproduction, where there are ontogeny and sexuality but no real perception yet, living beings can face and solve problems also only indirectly, but now there is a process of *ontogenetic maturation* too, the next stage of originality by which living beings also can develop new acts and individual achievements—which at the comprehensive level of the evolutionary system could also appear as the indirect solutions and utilizations of problems and thus initiate and sustain real comprehensive evolutionary achievements.

By the emergence of perception and memory living beings became able to recognize and solve problems directly by their own individual skills (lowest stage of originality in Polanyi's term) and their individual achievements as the achievements of ontogenetic maturation also could lead to the comprehensive evolutionary success of their lineages. At this level, we can claim that their knowledge (tacit skills and concepts) due to their individual personal experiences directly refers to the features of the comprehensive system and not only through the evolutionary process. A cat can directly recognize a dog and act accordingly. However, this new kind of individual knowledge of living beings becomes a really forceful power only when its developmental basis does not have to be recorded randomly in their replicative code anymore but can pass through from one generation to another in new ways by a fundamentally new information recording and transmitting system called cultural transmission.

So, to sum up in Polanyi's words: ‘No new creative agent, therefore, need be said to enter an emergent system at consecutive new stages of being. Novel forms of existence take control of the system by a process of *maturation*.’ (Polanyi 1962: 395)

The epistemologically emergent evolutionary system of the beginnings partly becomes emergent in the ontological sense by the maturation process of emergent evolution, that is, by the active comprehensive achievements of living beings. Reality unfolds its hidden aspects, genuinely new skills and knowledge of living beings emerges, and as ‘novel forms of existence take control of the system’ the Earth becomes a planet rich in life. There comes no more matter to the surface of Earth, ‘merely’ the knowledge of living beings which emerges at the different spaces and levels of the comprehensive orders of the evolutionary system due to the active nature of time working in the centre of all living beings.

## 5. Conclusion

There is no personal knowledge without personal reality. Dualism implies creation and absolutism concerning our knowledge. Materialism, in turn, questions even the most obvious facts of evolution ‘to avoid facing the problem set to us by the fact that the universe has given birth to these curious beings, including people like ourselves.’ (Polanyi 1962: 35)

Our knowledge is personal because of one reason: we are the children of evolution. Everybody sees the world from a unique place, a unique time, and a unique body: ‘we must inevitably see the

universe from a centre lying within ourselves.' (Polanyi 1962: 3) Here lie the tacit roots of our knowledge helped us to survive in the evolutionary system of the Earth.

The authority and power of materialism in science are enormous. But if we want to be personalist following Polanyi, we will have to preserve our consistency even in the case of the hardest topics. Every scientific fact has a personalist/emergentist explanation. And many of them have only emergentist one. The origin and evolution of life are two of them.

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Fig. 1

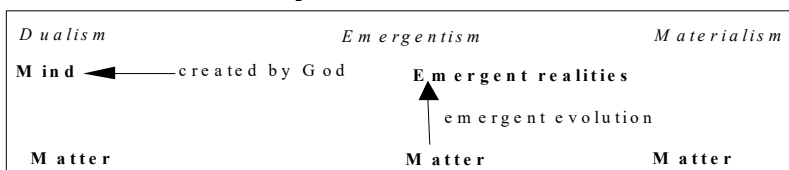


Fig. 2

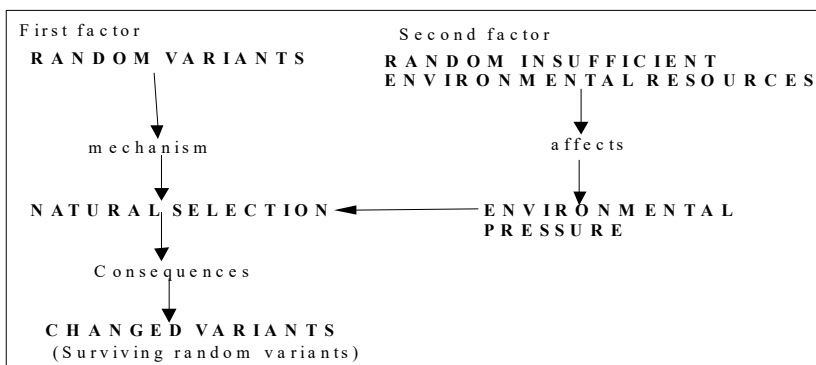


Fig. 3

