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Accommodating Probability to Durability as Facing the Onset of Biological Phenomena From Within

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Abstract: Life distinguishes itself from non-life in taking advantage of the cohesion of temporal origin which non-life cannot afford. The temporal cohesion letting the local participants adhere to each other in a contemporaneous manner refers to an instance of the precedent product being pulled into the subsequent production. Setting the precedent is equivalent to preparing the conditions for the subsequent to follow. A concrete implementation of the cohesion of temporal origin, compared with the spatial cohesion common in physics, is found in the natural construction of a reaction cycle with use of the temporal affinity exerted from the immediate local environment. That construction is a temporally local phenomenon in the experiential domain, rather than in the theoretical. The cohesion originating in the local environment is due to the local act of measurement by the environment. A major component of the local environment to each reactant in the reaction cycle is the cycle itself. The cohesion specific to the reaction cycle rests upon the fact that every reaction product from the upstream production in the cycle comes to be fed upon by the immediate downstream production. Every production constituting the reaction cycle is temporally adjacent to and contemporaneous with the similar others residing in the whole cycle, in sharp contrast to the case of the open-ended linear chain of reaction. One externalist scheme of appreciating the internalist enterprise of constructing a durable reaction cycle in a contemporaneous manner may become possible as referring to the Bayesian probability. The durable reaction cycle may be made actual with probability unity under the condition that the products from the preceding production come with the protocol for the similar production to come subsequently.

Keywords: Bayesian; durability; environment; externalist; internalist; measurement; observer; origin of life; probability; production; reaction cycle

1. Introduction

The origins of life still remain enigmatic both empirically and theoretically. If one intends to address the related issues experimentally, it would be required to face with how to design the experimental setup to be attempted. This stage of designing is understandably theoretical even though theory alone of any kind may not be good enough to meet the challenge. One candidate for designing the theoretical model of the intended experimental setup must be to refer to the laws of motion such as the Schrödinger equation of motion available to quantum mechanics. A definite advantage of appreciating the equation of motion is found in that it is integrable globally, at least conceptually if it is also supplemented with the well-prepared boundary conditions. However, one serious problem with accepting the law of motion on the foundational level is that it remains reticent on how to prepare and figure out the boundary conditions in the first place [1]. Shaping boundary conditions in the natural setting is also a genuine dynamic process. More than that, the law of motion does not say anything specific about what the boundary conditions may look like. This negative assessment does by no means denigrate the successful role of the law of motion assumed in limited classes of various

biological phenomena in a piece-wise manner. Despite that, there has been available no successful report on jumping over the hurdle at approaching the origins of life as employing the scheme of a closed one-pot experiment.

One likely reason for the difficulty in conceiving of the successful closed one-pot experiment for the origins of life may be found in the stifling nature of the methodology employed herewith. The boundary conditions open to their outside, on the other hand, can be generatively variable and be updated on their own, rather than being imposed and fixed externally. They can be neither controllable nor pre-programmable by the external observer sitting outside the empirical world. Nonetheless, one positive aspect of the notion called boundary conditions open to their outside is that they come to terms with the act of measurement. For boundary conditions are about something to be identified as such by the observers internal to the material world, and not necessarily controlled exclusively by the external observer like us [2,3]. Once it is taken for granted that the non-anthropocentric measurement by the internal observers is ubiquitous, attention to the dynamics of internal measurement or naturalizing the boundary conditions would become inevitable.

First of all, the notion of boundary conditions is local in their implication. The function of boundary conditions is to regulate a focused set of the material participants in a locally constrained manner. What is unique to the local regulation is that the agency of the regulation can go beyond the scope set by the laws of motion that could potentially be globally integrable. This lack of integrability rests upon the local nature of each measurement internal to constructing, detecting and identifying the boundary conditions exclusively on the material basis. A well-known example of demonstrating a failure in meeting the integrability with the laws of motion is available from imposing the non-holonomic boundary conditions [4]. There is no case of identifying what will be measured before its actual measurement. In fact, each internal measurement of a local character is a chance event at best on the spot while it is going to be influenced by the similar others in the neighborhood only afterwards.

Accordingly, one serious issue relevant to the internal observers upholding internal measurement turns out to be how they could come to contribute to the origins of life if ever possible. For internal measurement may also be likely in the prebiotic stage. In particular, the environment adopted in quantum physics is full of internal measurement as demonstrated in the instance of quantum absorption by the environment. The act of quantum absorption is a type of internal measurement that can be locally decidable even without presuming the coordination extending to the global extent all at once.

For instance, the absorption of a single photon by a single atom constituting the environment can proceed locally even in the absence of the prior global coordination for telling which atom in the environment could actually absorb that photon. Nonetheless, the origins of life with use of internal measurement may raise the question of how the internal observers behaving incoherently with each other in the beginning could come to be integrated into a coherent unity in the end. The crux for addressing this issue in a head-on manner may be sought within the nature of the environment. For it is the environment that is responsible for qualifying the nature of internal measurement as revealed in quantum absorption [5].

2. Internal Measurement as a Cohesive Factor

Measurement internal to the material world is local in feeding upon the quantum resources available from the material body to be measured in the participatory perspective of a local character [6]. Furthermore, any material body comes to be measured by its immediate local environment without being supplemented by the scheme of global coordination to be established in an instantaneous manner. Nonetheless, the act of measurement on the material ground may serve as a means of implementing a physically cohesive bridge connecting what is measuring with what is being measured. That is measurement-induced cohesion of the environmental origin. The measuring agency is latent in each local environment.

Measurement-induced cohesion as met in quantum absorption proceeding only locally is certainly physical. However, it goes beyond the scope of those physical interactions globally integrable as

going to proceed strictly under the control of the laws of motion. A single local act of measurement cannot be substituted by an ensemble of such measurements that may be approachable in a globally consistent manner. Measurement of a local character, compared with the laws of motion, is irreversible in sharply distinguishing between before and after its own act. These observations may suggest to us one more possibility of raising a de novo integration out of internal measurement with the help of measurement-induced cohesion. A case in point could be the possible occurrence of a chain of chemical reactions open to their immediate environments and eventually of forming a reaction cycle out of the chain.

Just for the sake of argument, let us suppose reactant A in the reaction solution not in thermodynamic equilibrium is going to internally be measured by its immediate local environment E_A and then transformed into another reactant B. This transformation may owe itself to the measurement-induced cohesion originating in the local environment E_A . The temporal cohesion letting the local participants adhere to each other in a contemporaneous manner refers to an instance of the precedent product being pulled into the subsequent production. Setting the precedent is equivalent to preparing the conditions for the subsequent to follow. Although the temporal cohesion as embodied in the measurement-induced cohesion is certainly physical in its operation, it has been marginalized in the standard practice of doing physics so far for the sake of appraising the spatial cohesion instead.

As following the similar fashion, suppose that reactant B is going to be measured by the immediate local environment E_B , that could be different from E_A , and transformed into another reactant C. As repeating the similar scheme, let us further suppose the downstream reactant Z is going to be measured by its immediate local environment E_Z and transformed back into the product that is the same as the starting reactant A in kind.

The overall consequences could be formation of a reaction cycle as depicted as $A \rightarrow B \rightarrow C \rightarrow \dots \rightarrow Z \rightarrow A'$ out of the open linear chain $A \rightarrow B \rightarrow C \rightarrow \dots \rightarrow Z$, in which the new product A' is the same as the starting reactant A in kind [7]. The reaction cycle is a physical scheme of making every downstream production directly cohesive to the product from the immediate upstream production while there is no such cohesion available to the open linear chain. Instrumental to forming the reaction cycle is participation of the additional cohesion acting between the immediate local environment of the end-product Z of the linear chain and the new product A' . Implementation of the additional cohesion may be made likely only after the reaction cycle happens to have been formed. Thus, the reaction cycle, once happened to appear, would tend to be stabilized since then with the help of the emergent cohesion even if its appearance may proceed spontaneously without recourse to such a cohesion. The emergence of the cohesion enabling the reaction cycle likely is accordingly irreversible unless those disturbances such as thermal agitations of a random nature may be overwhelming.

More specifically, the likelihood of the occurrence of the product A' to be expected in the end of the first round may come up as following the production protocol already latent in the starting reactant A. Then one can apply the notion of Bayesian subjective probability as addressing the relationship between the product and the production protocol. For the production protocol may be attributed as the hypothesis formed by the Bayesian internalist that can be associated with the immediate local environment of each reactant constituting the cycle. The Bayesian internalist resides within the experiential domain, rather than strictly within the theoretical, since it can tolerate the act of forming hypotheses. If the production protocol implicated within the preceding product is competent enough to yield the same product in kind, the similar production sequence can continue indefinitely with probability unity under the stated conditions unless severely disturbed externally otherwise.

The empirical likelihood of a reaction cycle conceived of as a harbinger of the origins of life may be sought within the measurement capacity latent in each of the local environments. In particular, the likelihood of a reaction cycle in this empirical world could be a concrete instance demonstrating a coherent integration of internal measurements, each of which is of the local environmental origin. Physically pivotal to the coherent integration of internal measurement is a cohesion of the local

environmental origin. Internal measurement can thus serve as a cohesive factor for enabling an irreversible transformation of an open linear chain reaction into a reaction cycle physically feasible.

3. Integrating Internal Measurement

One possible argument for supporting internal measurement as a candidate of furnishing the synthetic capacity required for the onset of life phenomenon is however quite convoluted. Quantum absorption as a prototypic example of internal measurement does not by itself demonstrate its own durability. Prerequisite to providing internal measurement with the durable synthetic capacity is a material scheme of an ad hoc nature to be tested empirically. At this point enters the physical likelihood of a reaction cycle as a possible means of integrating internal measurement into a closed circular form of a durable nature.

What is specific to a reaction cycle is that any component reaction constituting the cycle can find and cohesively feed upon the product from the immediate upstream reaction as going round the cycle. Crucial to implementing the cohesion needed to implement the reaction cycle is the prior concentrations of the participating reactants. If the concentrations are too low to hold the cycle as facing the disturbing thermal fluctuations of a random origin, the compartmentalization of the reactants into the circular configuration may not be likely. In particular, if the resources for running the cycle are constantly replenished and if the disposals from the cycle are properly processed, the contemporaneous constellation of the participating reactants could be stabilized. The contemporaneous constellation precedes the compartmentalization.

A merit of referring to the contemporaneous constellation is found in the ease with which the direct product from the upstream production can internally be taken as the reactant to the immediate downstream production in a contemporaneous manner. Take, for instance, a reaction cycle $A \rightarrow B \rightarrow C \rightarrow \dots \rightarrow Z \rightarrow A'$.

To the internalist, the product B from the transformation of A may be taken to be temporally adjacent to and contemporaneous with the transformation of B into C. As following the similar sequence, the transformation $Z \rightarrow A'$ may also be taken to be temporally adjacent to and contemporaneous with $A \rightarrow B$, in which both A' and A are the same in kind. In short, the whole transformations constituting the cycle may be regarded as being contemporaneous with each other insofar as the class identities of the participating reactants are attended to. For every reaction in the cycle is cohesively connected to both the nearest neighbors in the immediate upstream and downstream directions in a contemporaneous manner. Being contemporaneous then comes to propagate as going round the cycle like a well-coordinated movement of all the performers participating in a closed circle dancing hand in hand even with no music to be attuned to. That is to say, live with facing the music even in the absence of an actual music being played.

The present internalist perspective certainly differs from the externalist counterpart which distinguishes between what is going on and what has been done in the globally consistent manner. One distinctive aspect unique to the externalist perspective is the nature of time adopted there. The externalist views time to permeate into everywhere in the universe in a globally integrable manner even if the relativity of being simultaneous is admitted within such a global context. The physical laws of motion, as a matter of principle, are integrable in terms of time appearing there.

This integrable nature in terms of time to the global extent however does not apply to the contemporaneous constellation of the reaction cycle perceivable only within a local context. A principal reason behind this is that time appearing in the laws of motion refers to an abstract notion called coordinate or mass, and the wavefunction as a class property of an elementary particle. Even if an atom is referred to in terms of its wavefunction, it must be a class property abstracted from an individual atomic particle of a concrete particular nature. Furthermore, how could the class property be abstracted from each concrete individual must be anyone's guess though it has worked quite well in physics with some reservations [8].

In contrast, the case of a reaction cycle is a bit different. In the truncated expression of a reaction cycle $A \rightarrow A'$, the reactants A and A' are two different individuals while they belong to the same class. When each reactant of a reaction cycle is maintained through exchanging the atomic components, replacing the outgoing atomic component with the incoming one must be contemporaneous with each other. Otherwise, the stability of each reactant constituting the cycle may be jeopardized. The agent responsible for keeping the stability could be the immediate local environment surrounding each reactant.

Nonetheless, the relationship between the externalist and the internalist is not necessarily antagonistic. One undeniable advantage of the externalist stance is in that it can legitimately appreciate the significance of the class property of each individual as keeping the classical notion of the uniform flow of time intact everywhere. This is however simply a reminder that the externalist as an outsider is competent enough to comprehend what has already been constructed, whereas the agent of construction is the internalist as a practitioner. Mediating between the internalist perspective and the externalist one would come to address the distinction between the individual identity and the class identity of the same reactant on a par without sacrificing one for the sake of the other. The externalist is well versed with the class identity of the individual components for the sake of the intended epistemological enterprise at the expense of the individual identities of an ephemeral nature. In contrast, the internalist is experientially competent in integrating internal measurement as going round the cycle without relying upon the classical notion of the uniform flow of time. It can also provide the externalist with an epistemological object as appreciating the individual identity of each participating component in a distinctive manner.

4. Bayesian Update

One likely candidate for fulfilling the role of mediating between the externalist and the internalist must be the Bayesian subject. This is because the Bayesian subject can process the notion called probability as the externalist can do. At the same time, the Bayesian subject can also form a hypothesis or expectation like the internalist serving as the agent of construction available in the natural world can do [9].

When we address a reaction cycle, its durability is seen in the integrated activity of both the constant intake of the necessary resources from the outside and the constant release of the disposals to the outside. The current release of the disposals sets the condition for the subsequent intake of the resources. Similarly, the current intake of the resources sets the condition for the subsequent release of the disposals. This interplay implies that the concurrent measurement of the two distinguishable conditions by one and the same internal observer. It comes to yield the equivalence of the two conditions in their implication, in which the equivalence is to be guaranteed by the empirical durability of the reaction cycle of interest.

The internal observer as the Bayesian subject identifying the condition for making its own duration actual will be synonymous with the very deed of its actual implementation thanks to Bayes' theorem. As a matter of fact, the durability of a reaction cycle resides within the interplay between the datum d for the actual occurrence of the cycle and the hypothesis h for the condition for the occurrence of such a cycle. When the external observer refers to the likelihood or the prior probability $p(d/h)$ of the event of expecting d upon h envisioned by the reaction cycle as the internal observer, the posterior probability of the hypothesis h , given the observed datum d , is embodied in Bayes' theorem $p(h/d) = p(d/h)p(h)/p(d)$. What is specific to Bayes' theorem is its capacity of relating the prior expectation by the internalist to the posterior observation by the externalist. The internalist here is regarded as being an internal Bayesian subject by the externalist.

The joint probability $p(d \cap h)$, referring to the conjunction of d and h enacted by the internal observer, would then come to reduce to $p(d)$ ($= p(d \cap h)$) in the eyes of the internal observer to whom h remains inseparable from d . The proposed reduction of $p(d \cap h)$ into $p(d)$ comes to modify the Bayes' theorem into $p(h/d) = 1$. For the chemical affinities exhibited by the focused reaction cycle would be nothing other

than the hypotheses entertained by the cycle as the internal observer. The conjunction of the datum and the hypothesis implies that the datum is realized as carrying the hypothesis that is prerequisite to the succeeding datum production to come. The data remain inseparable from the hypotheses towards the Bayesian internalist legitimately anchored on the material ground. Despite that, both may seem separable towards the externalist strictly on the methodological ground because of accepting the classical externalist notion of the uniform flow of time permeating into everywhere [10].

More specifically, as referring to the conditional probabilities such as $p(h/d) (= p(d \cap h)/p(d) = 1)$ and $p(d/h) (= p(d \cap h)/p(h))$, can one readily obtain the duo of $p(h/d) = 1$ and $p(d/h) = 1$, the latter of which is derived from $p(d/h) = p(d)/p(h) \leq 1$ with the use of $p(h) \leq p(d)$ to be deduced from $p(h/d) = 1$. This deduction proceeds as follows: One obtains the inequality $p(h) \leq p(d)$ from the equality $p(h/d) = 1$ since h constitutes a subset of d . At the same time, another equality $p(d/h) = p(d \cap h)/p(h) = p(d)/p(h)$ would give the inequality $p(d) \leq p(h)$ because of the probabilistic condition of $p(d/h) \leq 1$. Thus, the exceptional conjunction of the seemingly two opposing inequalities of $p(h) \leq p(d)$ and $p(d) \leq p(h)$ must only be the equality $p(d) = p(h)$. In brief, the externalist way of appreciating the internalist to whom forming the hypothesis h looks inseparable from producing the data d eventually comes to imply the equality of the prior probabilities $p(d) = p(h)$, thus yielding $p(d/h) = 1$.

The equality $p(h/d) = 1$ then guarantees the products (data) preparing the condition for the production to come with the conditional probability unity if the data and the hypotheses are inseparable. Likewise, the equality $p(d/h) = 1$ also guarantees the production protocol (hypotheses) yielding the products to come with the conditional probability unity if these two of the data and the hypotheses are inseparable.

In particular, no matter how small the prior probabilities $p(h) (= p(d))$ may be, the product having the capacity of identifying the condition for the similar production to come, once it happens to appear, could repeatedly be updated in a durable manner with the conditional probability unity since then. On the other hand, however, if the two conditions for resource intake and for disposal release are taken to be completely independent of each other, it would be required to go back to the stage before the emergence of a robust atomic scaffolding supporting a durable reaction cycle.

The durability upon the surviving reaction cycle rests upon the cohesion extended towards each participating reactant from the surrounding immediate local environment. Since the local environment consists of the preceding products, the cohesion from the environment can be taken to be retrocausal [11]. For the predecessor currently surviving in the cycle in the present comes to regulate the successor to emerge with the help of internal measurement. The measurement-induced retrocausality certainly differs from mechanistic causality requiring the notion called force for moving any material object towards the future at the present.

5. Appraisal of Retrocausality in Quantum Phenomena

Retrocausality in quantum phenomena is pivotal in forming a closed loop of causations ab initio thanks to the built-in scheme of constantly letting the succeeding effect update the preceding cause as going round the loop forwards. The regulation of the successor by the predecessor in quantum phenomena also comes with the update of the predecessor because of the bilateral indexical activities acting between the two. For non-anthropocentric measurement is indexical rather than symbolic. Such an update scheme of a selective nature calling for the task of pruning off the incompatible quantum interferences internally in retrospect, in the light of a measurement in the quantum regime, is not available to the classical regime. There is no room left for the classical causality to address and scrutinize the issue of accommodating the present to the past because of accepting the classical nonrelativistic notion of the uniform flow of time everywhere [12].

On the other hand, the likelihood of a causal loop is found within the capacity of adjusting the past to the present in a retrocausal manner, instead of adjusting the present to the irrevocable past. Quantum measurement as an indexical activity admits that both the agent of measurement and the body to be measured are amenable enough to each other because of the inevitable entanglement

operating between the two. Entanglement between any two parties makes every participant agential to the remaining other. Otherwise, the loop would lose its robustness once it happens to suffer disturbing influences from the outside. In fact, there has been an experimental confirmation on the establishment of a consistency between causality and retrocausality with the use of an artefactual quantum circuit of circulating photons [13]. The focused consistency was revealed in the precipitation of pure quantum states, rather than mixed states, when the photons in the output from the circuit were measured. Adjusting the past to the present is simply no more than just accommodating the succeeding production to the products from the immediately preceding production currently surviving in the loop so as to leave no conflicts behind. Adjusting the past to the present while accommodating the present to the past may touch upon an enigmatic nature of time entertained in quantum phenomena.

The loop realized artificially in the quantum realm is a scheme of holding part of the past in the present. Accordingly, the past is adjustable in the present although it may look counter-intuitive at first sight. In a similar context, the reaction cycle is simply a practical implementation of the causal loop which necessitates the participation of retrocausal regulation.

6. Empirical Background

The operation of a reaction cycle as an empirical phenomenon is characterized by its durability of a historical nature. Even if it differs from an invariant common in physics, the durability can certainly serve as a reliable and quiescent standard in reference to which any description of biological phenomena may be made feasible [14].

Of course, although there exists a definite difference between invariant in physics and durability in biology, any description may be open to allowing for a descriptive object specified by its class property, not to mention the individual identities of the constituents. An ordinary noun conceived of as an abstraction out of the direct referents of a concrete individual nature may also be regarded as a symbol referring to an ensemble of such similar referents. Durability thus suggests a possibility, such that the durability as a class property may be maintained even if the constituent individual components are constantly alternated with the other individuals belonging to the same class. One candidate meeting this challenge is a Michaelis–Menten scheme of enzyme–substrate kinetics that could be ubiquitous in biochemical phenomena [15].

One likely description of the Michaelis–Menten scheme is to employ the reaction kinetics in the form of an equation of motion. It is however definitely different from the similar one adopted in physics such as the Schrödinger equation of motion that is ahistorical in its essence. In contrast, the Michaelis–Menten kinetic equation is historical in accepting a history-dependent boundary condition in the form of an enzymatic template. Appreciating the historicity requires for us to admit that the allowable temporal translation must be unidirectional or irreversible as being limited only to pointing towards the future from the present. In particular, the past history referable in the present is frozen into the enzyme functioning as the template for the production to come.

Once something called a substrate molecule is entrapped by an enzyme molecule, the substrate is transformed into a product molecule which is going to momentarily be released from the template. The template thus made unoccupied and vacant accordingly, can repeat a similar cycle of entrapping the substrate, making the product and releasing it ad infinitum insofar as the substrate is constantly replenished from the outside.

The reaction sequence processing the enzyme E, substrate S and product P is going to schematically follow $E \cdot S \rightarrow E \cdot P \rightarrow E \cdot S'$. Here, the enzyme-substrate complex $E \cdot S$ is transformed into the enzyme-product complex $E \cdot P$, and the product P is subsequently released from the enzyme E. Thus, the enzyme made unoccupied becomes capable of entrapping another substrate S' that is the same with the former S in kind but definitely different from it individually. The cycle can repeat itself as letting those concrete individuals drop anchor at the invariable class property. The reaction cycle upon the Michaelis–Menten scheme is thus made descriptively accessible as referring to the common class property of the participating substrate molecules that could be individually different.

What is unique to the Michaelis–Menten scheme is the preservation of a contemporaneous constellation of the enzyme–substrate complex of a historical nature. The transformation $E\cdot S \rightarrow E\cdot P$ is contemporaneous between the pair of the complexes $E\cdot S$ and $E\cdot P$. For the unity of both the complexes is maintained in the middle of the transformation. Likewise, the transformation $E\cdot P \rightarrow E\cdot S'$ is also contemporaneous between $E\cdot P$ and $E\cdot S'$. Furthermore, if one pays attention exclusively to the class property of the substrate, no distinction between $E\cdot S$ and $E\cdot S'$ could be identified by such an external observer. The consequence is the completion of the reaction cycle in a contemporaneous manner at least insofar as only the class property is attended to. There is no case of turning the product directly into the substrate with the aid of the enzyme in the present irreversible scheme.

While the substrate can be replenished every time externally, the same enzyme, definitely of biological origin carrying the path-dependent history behind, repeatedly participates in the transformation of the substrate into the product. Here, the contemporaneous constellation is about the reaction scheme of reactants further qualified by their past histories available at the present moment of the now which should be a brief reference to being contemporaneous. The now is accordingly relational in referring to something being contemporaneous with something else, whereas the present referred to in the present tense can stand alone and remains at most as an abstraction [16].

The contemporaneous constellation of the enzyme-substrate complex can thus be preserved once we pay attention to the sameness of the class property of each substrate molecule to be alternated every time. What is unique to the now, referring to the contemporaneous constellation, is that it can coexist with the individual substrate molecules carrying the different histories such as S and S' . An advantage of referring to the contemporaneous constellation may be sought within its durable class property. The class identity of the contemporaneous constellation of the enzyme-substrate complex may be kept intact insofar as the substrate molecule is constantly alternated with a similar one belonging to the same class.

7. Discussion

The contemporaneous constellation of a reaction cycle as demonstrated in the enzyme–substrate complex may be taken as a reference to the self in charge of constructing and maintaining the cycle from within. This is due simply to the emerging cohesion of a temporal character letting every preceding product constituting the cycle be fed upon by the immediate downstream production to come as going round the cycle.

Prerequisite to the emergence of the self that could be assimilated to the contemporaneous constellation of a reaction cycle is the reaction environment itself. At this point enters the significance of absorption phenomena latent in the physical environment at large. On one hand, the absorption of the radiation field by the environment could be conceived of in a globally consistent manner in classical physics [17]. On the other, quantum physics may regard the absorption by the local environment as an instance of measurement [18]. Of course, this does not prohibit from introducing a theoretical artifact to make it globally consistent.

In particular, the local event lacking the global coordination with the rest of the world all at once is in conformity with the act of measurement that is necessarily of a local nature. From this perspective, the physical activity upholding the measurement by the environment is intrinsically cohesive to the reactant to be detected internally in that it pulls in the quantum particles from what is to be detected. The cohesion intrinsic to the act of measurement is just another way of looking at the ubiquity of the phenomenon of quantum absorption.

Once due attention is paid to the ubiquity of quantum absorption of a local nature, the occurrence of the self as a reaction cycle to be precipitated from the reaction environment may become visible more easily. What is significant to the emergence of a reaction cycle is the accompanied emergence of an additional cohesion making the cyclic structure robust enough compared to the cases otherwise [5]. Every downstream production comes to pull in the product available from the immediate upstream production as going round the cycle. The reaction cycle is unique in making its every constituent

production affinitive to the product from the immediate upstream production compared to the open-linear chain of reactions. For the reaction-product at the downstream-end in the open-linear chain finds no counterpart to pull it in.

Putting it simply, the contemporaneous constellation of a reaction cycle comprising the atomic components, each having the unique path-dependent history, turns out to be the self in charge of regulating both individual and class identities in a congruent manner. The self is durable when its class identity is referred to, while it is also generative at the same time in constructing the class identity out of those individuals carrying the ephemeral identities of the component origin. Of course, the agent recognizing the class identity as such is the external observer like us, rather than the internal observers in charge of a wide variety of synthetic activities. History is made by each participating individual, while recognizing the consequential history as such is up to the competent historian not participating in the construction.

Once the emergence of the self as an empirical phenomenon is taken for granted, it would be too much to ask for that the external observer may be able to come to terms with the emergence of the self. This predicament may be due arguably to the other side of the same coin called the privilege that the external observer has enjoyed so much for so long. The external observer has been quite at home with taking advantage of the symbolic language, which is full of those symbols denoting the class properties of the referents. The self is no exception.

Despite that, referring to one dictionary listing of the self as “the realization or embodiment of an abstraction” (cf., Merriam Webster’s) reminds us that the self as a distinctive property of life may also imply something concrete particular to eventually be abstracted away. Any stand-alone symbol detached from its concrete referents remains as a reference to their class property at best. More specifically, the self has a definite link to something concrete particular unless forcibly stipulated otherwise externally. One impending issue in this regard must be how to save the concrete particular implications when it becomes inevitable to refer to the self in any case. A decisive factor distinguishing between non-life and life is in that life takes advantage of a unique type of temporal cohesion thanks to the operation of a reaction cycle which non-life may not be able to take part in. The temporal cohesion as the agency of updating the contemporaneous constellation of the reaction cycle proceeds through integrating internal measurement without presuming the externalist stipulation of the uniform flow of time.

One promising key to cope with the issue of the self as a legitimate conglomeration of both concrete particulars and general universals must be to pay attention to the distinction between the individual identity and the class identity of the same referent. At this point, physics has been skillful in appreciating the significance of an invariant as the individual identity to be preserved in time. In contrast, biology is versatile in appreciating the durability of the class identity of the self instead of the individual identity of each component as physics does. Nonetheless, biology is unique in taking advantage of the ephemeral individual identities of the constituent elements. The ephemerality of the individual elements can serve as a source of implementing the capacity of additional cohesions enabling and holding a whole variety of exquisite material organizations likely in the biological realm.

Biological phenomena are full of qualitative richness. One candidate for meeting this challenge for providing the phenomena with their qualitative richness is sought within the individual quantum particles. The implicated richness due to the ephemeral individual identities of the atoms or molecules can durably be kept inside the organization as constantly being alternated with the different ones belonging to the same classes repeatedly. In short, all biologists would have to be physicists while all physicists may not be biologists [19,20]. Implementing whatever cycles by chance even of external origin serves as both the physical means for and the biological realization of enhancing the cohesion for an organizational closure. Of course, the long-term survival of the organizational cohesion must be protected by some additional means against, for instance, those deleterious free-riders on the cycles such as an RNA virus.

8. Concluding Remarks

Probabilistic assessment of the origins of life seems extremely convoluted in that the likelihood of the probability-assessor as the external observer like us would have to be presumed from the start. However, it would be flatly implausible to conceive of the participation of the external observer right on the verge of the origins of life in the natural world. Nonetheless, the chemical synthesis of life phenomenon out of scratch, even though it may look like an endeavor for groping in the dark, would necessitate the participation of the internal observers. Any chemical reactant is detectable by the immediate environment of a local character so as to figure out the reaction partner exclusively with the natural use of the mediating chemical affinities.

The origins of life in an empirical sense may be associated with an instance of integrating the internal observers, each of which might be acting incoherently with the similar others, into a coherent unity such as a reaction cycle. What is unique to the natural operation of a reaction cycle is that each reaction product in the cycle comes up with the production protocol for the immediately subsequent products to follow. The agency of the downstream production substantiating the activity of cohesively feeding upon the products from the immediate upstream production is sought within the local environment surrounding the preceding ones. The precedent sets the condition for how the subsequent may proceed. That may sound teleological.

One externalist scheme of appreciating the internalist enterprise of constructing a durable reaction cycle may be made possible as referring to the Bayesian probability. The Bayesian subject addressing the issue of probability may be the externalist, whereas the same subject forming whatever hypotheses or the production protocols internally can be taken as the internalist. The durable reaction cycle may be made actual with probability unity under the prior condition that the products from the preceding production happen to come with the protocol of the similar production to follow repeatedly. The externalist can theoretically make a descriptive access to a durable object which the internalist could only experientially come up with. Prerequisite to theoretical deduction must be experiential production.

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