

Article

Temporality Naturalized

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Abstract: The Schrödinger equation for quantum mechanics, which is approachable in third-person description, takes for granted tenseless time that does not distinguish between different tenses such as past, present, and future. The time-reversal symmetry grounded upon tenseless time globally may, however, be broken once measurement in the form of exchanging indivisible quantum particles between the measured and the measuring intervenes. Measurement breaks tenseless time locally and distinguishes different tenses. Since measurement is about the material process of feeding and acting upon the quantum resources already available from any material bodies to be measured internally, the agency of measurement is sought within the environment in the broadest sense. Most indicative of internal measurement of the environmental origin are chemical reactions in the reaction environment. Temporality naturalized in chemical reactions proceeding as being subjected to frequent interventions of internal measurement is approachable in second-person description because of the participation of multiple agents of measurement there. The use of second-person description is found in the appraisal of the material capacity of generating, distinguishing, and integrating different tenses. An essence of the temporality to be naturalized is within the genesis of different tenses. A most conspicuous exemplar of naturalized temporality is sought in the origins of life conceivable exclusively on the material ground.

Keywords: causality; embodiment; measurement; regulation; retrocausality; second-person description; symmetry breaking; temporality

1. Introduction

One of the tenacious difficulties associated with addressing the issue of time resides within the scheme of addressing this issue itself. No discourse on time could be likely unless the temporality for making such an ongoing discourse possible on the linguistic ground is guaranteed in the first place. While any linguistic discourse of whatever kind may be sequential in time in its own making, the issue of time as a descriptive object would have to remain invariably concurrent with the sequential development of the discourse itself. Otherwise, the whole descriptive enterprise would have to collapse. The present collapse of the descriptive enterprise is about nothing other than a matter akin to an Aristotelian metaphysical aporia. It points to the difficulty in addressing something both sequential and concurrent, or equivalently, something both continuous and discontinuous, in a mutually congruent manner. There must be no likelihood of conceiving of a continuity in terms of the succession of discontinuities.

Of course, if one concentrates only on an epistemological aspect, as Kant took the lead in this endeavor, it could be likely to enshrine time as the transcendental condition saved for the sake of the invincible Ego overseeing the epistemological enterprise to be attempted there. Succession of time grasped in the form of causality connecting cause and effect in sequence can certainly uphold such epistemology. Nonetheless, the issue of time is more than simply being a matter of epistemology. Physics has been quite eloquent in addressing time as being a major physical issue. Put differently,

physics might be open to such a possibility of conceiving of time in the mold other than that following the linear causality appreciating cause preceding its effect.

Physics has been unique in imparting the capacity of measuring or experiencing others to the measurement apparatuses at large without limiting such a capacity only to the transcendental subject. At this point, measurement is taken to be a scheme of directly and locally experiencing something concrete particular through a material means. In fact, physics has long set such a methodological stipulation that the act of experiencing others may be grasped by integrating both the law of motion and its supplementary boundary conditions. Then, the notion of time employed in the law of motion would come to assume a specific role. That is the time-reversal symmetry of the law of motion, whether in classical or in quantum mechanics. The time-reversal symmetry goes along with the block universe picture, admitting only tenseless time in which all of the future and the past are equally real as the present is.

In contrast, the act of experiencing in the mold of naturalized measurement that can survive in the empirical world is constantly breaking the time-reversal symmetry in that what has already been experienced cannot be undone in that world. We take this local act of breaking the time-reversal symmetry to simply be a brute empirical fact. Experiencing of a concrete particular nature is constantly about concrete particulars out there in the neighborhood. This is, of course, not intended to denounce the law of motion, which must remain legitimate under the adopted framework of an abstraction in one form or another. The law of motion in terms of a point-mass in classical mechanics or of the wave function in quantum mechanics would remain invincible insofar as the adopted abstraction is sanctioned. This observation would then come to invite an opportunity for a new alternative in place of the strict separation between the law of motion of an abstract nature and the boundary conditions of a concrete particular implication. That will be to critically examine the currently adopted stipulation of relegating the contribution of concrete nature exclusively to the boundary conditions while keeping the abstracted nature of the law of motion remaining intact.

Our objective of the present article will be to explicate the nature of temporality available to the empirical world under the much weaker condition. This exercise will be attempted under the condition such that the strict separation between the law of motion and its boundary conditions may be relaxed with respect to accommodating their implications of both abstraction and concreteness mutually in a more amenable manner. Our goal will be the appraisal of the material capacity of generating, distinguishing, and integrating different tenses that are pivotal to breaking the time-reversal symmetry latent in mechanics as summarized in Section 8: "Either Tenseless Time or Tenses." Facing the breaking of the time-reversal symmetry may eventually come to part with the block universe picture admitting only tenseless time, which has long been cherished in physics.

The emergence of past, present, and future does not require the tenseless time as a premise. It requires only the local perspective and the act of measurement. In contrast, an attempt for getting the past, present, and future out of the tenseless time unique to the global perspective does require an additional assumption that contradicts the presumed tenseless time.

2. Breaking Time-Reversal Symmetry

The Schrödinger equation of motion in quantum mechanics is taken to be a major law of motion for upholding the empirical world, and is parameterized in tenseless time, i.e., it is compatible with the one with time reversed. Although it can reveal a rich catalogue of empirical regularities when supplemented with the concrete boundary conditions, the Schrödinger equation will also have something to say even if it is not supplemented with its specific boundary conditions at all.

Just for the sake of an argument, let us imagine that a single quantum particle, such as an electron, is moving in a given potential field in a non-relativistic regime where it is not accompanied with preparing the actual experimental setup nor with detecting its whereabouts with use of an actual measurement apparatus. Furthermore, suppose the direction of the flow of time is suddenly reversed. The effect of this sudden time-reversal operation will then turn out to be equivalent to changing the

positive mass of the quantum particle into the negative one of the equal magnitudes simply with respect to the phase factor of the concerned wave function only [1]. A similar change would also apply to the potential energy from the positive value to the negative one of the equal magnitudes, and nothing more.

The time-reversal symmetry of the Schrödinger equation could thus come to allow for both the quantum particle and its putative *counter particle* corresponding simply to the complex conjugate of the wave function of the original quantum particle. Of course, the counter-particle conceivable in this non-relativistic regime has no direct relevance to the antiparticle confirmed in the relativistic regime. The antiparticle has the same mass with the same sign the quantum particle has, but carries the equivalent physical charges, such as electric charge and magnetic moment, with the opposite signs.

The peculiarity of this temporal symmetry is seen in the potential likelihood for accommodating the linear complex of both the quantum particle and the counter particle at the same moment. Consequently, if both the quantum particle and its counter particle happen to meet at the same location, both can effectively disappear. For both the net mass and the net potential energy of the system vanish there due simply to the interference between the particle wave function and its complex conjugate [1].

The disappearance of the system of the quantum particle and its counter particle is thus ubiquitous in the quantum world unless measurement intervenes. If there is no chance of measurement in the empirical world, the likelihood of material embodiment of that world may be jeopardized in a non-relativistic regime because of the disappearance of any quantum particle meeting its counter particle with the use of the underlying time-reversal symmetry. Conversely, if the material embodiment of the empirical world happens to be the case as it should be, the breaking of the time-reversal symmetry imputed to the act of measurement would have to become inevitable insofar as the Schrödinger equation is referred to. Measurement distinguishes between measurements yet to come, in progress, and already done. That is about the distinction of the tense attribute specific to the quality of each measurement involved.

Since measurement is about the act of referring to a concrete particular aspect of an object to be measured, the agent of exercising such a specification could be sought nowhere other than the agent of measurement itself. The Schrödinger equation in itself is not agential. Although measurement is a quantum phenomenon, it is not subsumed under the scheme of what the Schrödinger equation would come to specify because the wave function adopted there has already been subjected to some sort of abstraction allowing for tenseless time.

Measurement in quantum mechanics is thus about a local activity for addressing the concrete particular nature of the object to be measured. On the other hand, the wave function in quantum mechanics, while legitimate in its own light, is about something global that has already been abstracted out from something else. This abstract nature, already being latent in the wave function, sets some limitation when it is used to decipher what measurement is all about in terms of the wave function. Even if the probabilistic interpretation of the wave function is taken to be factual, it would remain open at the least as to how it could be evaluated epistemologically or ontologically, or whatever else for that matter.

In any case, if both the global state description and the local act of measurement are accepted in the quantum realm, retrocausality in the form of retrodiction in addition to the standard causality upon prediction could also survive [1,2]. Retrocausality acting upon the quantum state is in fact a scheme of further modifying the state to meet the requirement for accommodating it to measurement [3]. It is meant to point to the implicit capacity already being latent in the state to further be qualified after the act of measurement.

One bottom line for addressing the act of measurement must be to refer to the common denominator available there, whichever sort of measurement may be attempted. That is to pay a legitimate attention to the concrete particular nature of the material body to be measured. One candidate for fulfilling such a stringent requirement must be sought in calling attention to

the quantum particles to be transferred from what is to be measured on one hand to what is measuring on the other. Although an exhaustive specification of each quantum particle is beyond our reach at this moment as with the case of a Kantian thing-in-itself, one concrete aspect confirmed, at least empirically so far, is its indivisible character as a quantum. Transferring the quantum particles from where being measured to where measuring is concrete particular enough in preserving the indivisible nature of each quantum particle to be mediated in the exchange process.

Prerequisite to the process of measurement is the transference of quantum particles from the material bodies to be measured internally in the empirical world. Transference of quantum particles from one party to another one is in fact equivalent to updating and regulating the boundary conditions applied to each party. The agent of measurement in charge of regulating boundary conditions is thus by no means limited to our fellow physicists armored with the custom-made measurement apparatuses specially designed for specific purposes. Any material bodies that can feed upon the quantum resources of a concrete nature available from whatever sources may assume the agency of measuring those sources with the use of and in terms of the reference under the guise of the resources to be transferred.

3. Measurement of Internal Origin

Whatever kind it may be, any measurement makes the agent of measurement distinct from the object to be measured. The agent of measurement is unique in demonstrating the cohesive capacity of pulling in the mediating quantum particles—whether photons, electrons, or whatever else—that remain indivisible in the process. Put differently, measurement is distinctive in differentiating different tenses, say, between measurement already done and that currently in progress, whereas the unitary quantum mechanics applied to a closed system is faithful to observing tenseless time. Of course, quantum mechanics in tenseless time can survive in the limit that the distinction between different tenses may be marginalized.

In the standard scheme of doing physical experiments, the agent of measurement is assumed by the measurement apparatus as a surrogate for the physicists who are responsible for designing and preparing the apparatus. Of course, this does not imply that no measurement is likely in the absence of the physicists. Rather, the physical measurement regulated by the physicists can serve as no more than a prototypic example demonstrating the ubiquity of the phenomena of measurement available in the empirical world. In any case, measurement is about the activity of a concrete particular nature acting upon a concrete particular object whereas the law of motion is about the activity of an abstract nature acting upon concrete particulars. Measurement in the quantum regime is about a concrete particular acting upon something else, also a concrete particular, as exchanging the indivisible quantum particles between the two. Even if it can be referred to as being probabilistic, quantum measurement in and of itself is not specific enough to explicate what the underlying probability space may look like. Proposing the probability space in theory is one thing, but providing it with supportive evidence is quite another.

When we say that there is a molecule of carbon dioxide in a specially designed box tightly sealed so as to prevent even the quantum tunneling, it is taken for granted that the carbon dioxide molecule is constrained to the inside of the box. The sealed box does not allow the molecule to leave from the inside of the box towards its outside freely. The carbon dioxide molecule is then supposed to experience or to detect such a confinement internally in the long run. The internal identification or measurement of the confinement is certainly physical but is not the direct outcome from the law of motion. It is simply an internal attribute of material origin ascribed to the boundary conditions applied externally. Nonetheless, this internal measurement or experiencing of the confinement on the part of the molecule itself goes along with the external measurement attempted by the physicists installing such a sealed box to let the molecule not escape from the box freely. Internal measurement is about the regulative agency of a concrete particular nature as going beyond the scope regulated and covered by the abstract law of motion of a general universal nature.

One obvious lesson we learn from the present pedagogical example is that internal measurement of the environment by the participants from the inside would become inevitable. Such an inevitable intrusion of internal measurement must be the case even if the environment can be regulated to some extent by the externalists such as the physicists from the outside. Although it may be in accord with doing standard quantum physics to conceive of both an open quantum system and the residual environment cut out of a totally closed system in a top-down manner, internal measurement is about the agency of detecting and constructing the environment in a bottom-up manner.

In a similar vein, one can easily imagine the situation of a carbon dioxide molecule present in this earth-bound atmosphere. The relationship between the carbon dioxide molecule in focus and its entire environment is also of a measurement origin since the identification of the related partners is a prerequisite to establishing the relationship of whatever kind it may be. This does, however, by no means denigrate the role played by the law of motion. The only reservation with the standard law of motion is sought in its lack of the capacity of specifying the details of concrete particular nature of the material bodies in motion. Physics is already implicit in admitting its own capacity of being experiential or being susceptible to the influences coming from the outside by way of appreciating and accepting the notion called initial boundary conditions.

If it is intended to identify the specific nature of the relationship between a carbon dioxide molecule and the covering whole earth-bound environment, the process of measurement being competent in specifying the details of a concrete particular nature would have to be asked to take charge in place of the law of motion of an abstract nature. Prerequisite to installing the details of a concrete particular nature is the act of measurement by the agents of any sort, whether the physicists or whatever else for this matter. In this respect, the internal measurement by the participants is far more competent than the external measurement as a theoretical counterpart of the former.

The capacity of internal measurement on the part of the carbon dioxide molecule residing inside the environment can meet this challenge of internal identification. Internal measurement remains intact irrespective of whether external measurement intervenes. This is so even if the external measurement attempted by the physicist standing by on whereabouts that molecule is at all is made unfeasible because of the technical difficulties in one form or another. What is more, it may be simply inconceivable to put all the concrete specifications at the disposal of the physicist as the externalist. The bold enterprise of figuring out all the possible forms of regulation of a concrete particular nature is factually operative between the carbon dioxide molecule in focus and its naturalized environment. Internal measurement is thus bilateral in letting any participant be the agent of measuring its whole environment and likewise in letting the environment as an integrated body consisting of all the other participants be the agent of measuring each particular participant in focus [4]. Then, some inevitable convolution would come up to the surface.

Each participant can assume the two different roles. One is to measure its environment, and the other is to be measured by the environment. This may look like the contrast between action and reaction framed in the equation of motion available in classical or in quantum mechanics in a non-relativistic regime. However, what it eventually implies is quite different. The action and reaction conceivable in mechanics allowing for tenseless time only are totally synchronous because they are employing the abstraction of a methodological origin [5]. Once the equation of motion is taken to end up with a unique solution, there should be no room left for some indefinite arbitrariness to survive between any pair of action and reaction. Mechanics is thus quite peculiar in admitting both the time-reversal symmetry and the synchronous determination of both action and reaction in a totally coordinated manner.

Nonetheless, actual measurement breaks the time-reversal symmetry in the respect of observing that what has been measured cannot be undone any more. One cannot see its own eyes looking at something else at the same time. One loophole to escape from the present impasse arising from meeting both preserving and breaking the time-reversal symmetry in the same context would be to pay more serious attention to the act of measurement prior to framing the abstract law of motion.

This does by no means imply denunciation of the law of motion of an abstract nature. The issue will be to figure out the dynamics of the measurement origin that is principally concerned with the act of measurement of a concrete particular nature intrinsically from the local perspective as letting it be free from suffering those interventions of an abstract nature.

One of the intriguing aspects of the measurement dynamics is that the agency for measuring or identifying any participant should be sought in the whole environment housing that participant also. This is in conformity with the standard practice of doing physical experiments. The physicist takes it for granted that any individual material object placed under the fixed boundary conditions set by the physicist is assumed to abide by the conditions. The boundary conditions would come to have the measurement capacity of identifying that individual object abiding by the applied conditions themselves as such, otherwise the stipulation set by the boundary conditions would have to be jeopardized. Likewise, insofar as the dichotomy between any material participant and its environment is taken for granted, the environment comes to assume the measurement capacity of identifying that participant.

In short, the dichotomy between any material object and its environment is a prerequisite for asserting the presence of the object, even from the non-anthropocentric perspective. The environment is a necessary scaffolding for guaranteeing the occurrence of any individual. To put it simply, any individual is relative to its environment, even not to mention the relative state interpretation of quantum mechanics [6]. The act of measurement is already latent in making an individual participant relative to its environment that is supportive to any participant in focus. As much as the environment comes to measure each participant, the participant does the same to the environment because of the relative and bilateral nature of measurement involved there.

Once the measurement capacity of the environmental origin receives the due attention it deserves, the intriguing nature of temporality would manifest its distinctive character when the contrast between the environment and its participant is explicitly referred to. When one participant happens to be measured by its environment, the material basis of the measurement is in the transformation of the original participant into an alternative one. That is in parallel with the measurement in quantum mechanics proceeding as feeding upon the quantum resources and precipitating the accompanied transformation accordingly. At this point, it should be noted that the environment of the incumbent participant to be transformed into the alternative one differs from the emerging new environment to be applied to the emerging alternative participant. The transformation of the environment to be applied to the emerging participant is not simultaneous with the transformation of the incumbent participant but is sequential to the production of the emerging alternative one. For the measurement underlying each transformation takes time no matter how short it may be. In order to see what the eyes of one observer is seeing, it is required to have another observer nearby that can see the target observer and report the observed result accordingly.

The environment towards a product already made differs from the environment that was for its production. The active act on the part of the environment for measuring the incumbent participant resulting in the synthesis of an alternative one is sequentially, rather than simultaneously, following the passive consequence of the incumbent one synthesized by the environment. The consequence is to be registered in the production of the alternative transformed participant. Accordingly, the environment comes to constantly be re-organized to meet the newly emerged alternative one in sequence. Then, the reactively active act of measuring the alternative participant by the re-organized environment would follow suit, and ad infinitum.

The measurement dynamics is thus unique in revealing the lack of the concurrent determination of, or the simultaneous fixation of, both measuring and being measured. This exhibits a sharp contrast to mechanics observing the strict simultaneity of action and reaction. There is no danger of ostentatiously violating mechanics here, however. The measurement dynamics is principally about regulating something concrete particular due simply to establishing a correlation between being measured and measuring. In contrast, mechanics assumes a specific form of regulation in the mold of boundary

conditions applied to something already abstracted in the form of a law of motion. Although it is of course conceivable in the classical scheme, regulation is ubiquitous under the much wider context in the quantum regime once the act of measurement is focused upon. The agent of regulation is not limited only to the physicist standing by. Measurement can be internalized there where regulation could be operative. The material agency of regulation is grounded upon the act of measurement of material origin. Both being measured and measuring that could not be frozen in fixed boundary conditions are the two faces of dynamic regulation met in the quantum regime.

The concrete particular nature of regulation in the quantum regime is certainly different from the abstract nature of regulation already latent in the classical counterpart. When the relationship between any material participant and its covering environment is approached with the use of measurement of an internal origin, the direct access to the material participant of a concrete particular nature is beyond the reach of any agent of measurement. This is due simply to the indefinite spillover of the act of measurement ad infinitum. Like the Kantian thing-in-itself, a concrete particular is inaccessible directly to the external observer with use of the measurement scheme that remains reaction-free.

Measurement constantly inducing further measurement to follow remains indefinite in its implication since measurement at any moment constantly remains indecisive about and open to what will be measured. In the dialogue practiced in second-person description, for instance, how the listener would respond to the incumbent speaker may constantly be open to any possibilities.

The indecisive nature of measurement is nested within the second-person status of the dichotomy of any material participant and its covering environment, rather than within the third-person status approachable in third-person description. Once the measurement result is accommodated in the third-person status, the external observer can refer to the result in third-person description in the present tense. This concurrent descriptive reference to the measurement result is, however, not available to the participants in the second-person status because no completion of measurement is in sight towards each participant residing in the whole environment. The act of measurement is constantly open and susceptible to the measurement to subsequently come on the scene. The descriptive reference available to the participant would have to be at most that of being likely in second-person description. The agents of measurement likely in the empirical world come to communicate with each other only through second-person description without being controlled by the single descriptive author assuming the third-person status.

4. Appraisal of Second-Person Description

Referring to second-person description is unique in its temporality compared to the standard one adopted in third-person description that is common in practicing empirical sciences, not to mention philosophical exercises. Any theory in physics has been austere in allowing no intervention of second-person description. In fact, third-person description long accepted in physics takes for granted the presence of the descriptive context that can remain invariable during the ongoing discourse. This is just another way of saying that any theoretical discourse likely to be plausible should observe an invariant object tightly guarded within a fixed context. There is nothing special and strange about this observation insofar as it is allowed for the externalist to take for granted an epistemological stance toward any descriptive object out there.

One of the outstanding advantages with the epistemological enterprise is the pre-guaranteed separation between the observing subject as the externalist and the descriptive object. Third-person description is already a guaranteed scheme of separating between the subject and the object. This epistemological split eventually enables us to accomplish an integration of both the invariable presence of the descriptive context to be paraphrased and its descriptive grasp as following the sequence of the discourse to be practiced by the externalist. In fact, computation is a prototypical example of demonstrating the ubiquity of third-person description.

Nonetheless, the conformity intended for a simultaneous coordination between the fixed context guaranteeing the presence of a descriptive object and the sequential development of the underlying

discourse does not apply to second-person description. The dichotomy of any material participant and its covering environment is constantly open to the act of measurement to come internally. The material participant there remains indecisive in specifying how it will be transformed as being subjected to the measurement imputed to the environment, and the environment also remains indecisive as to what sort of material participant is going to be measured next. Despite that, the material participants are constantly decisive in revising the context for the act of measurement to be done on the spot [7]. In second-person description, there is no likelihood for the context, standing immutable, to be relied upon.

The uniqueness of second-person description is most visible in our long-held practice of valuing dialogues in the linguistic domain. However, the difficulty associated with the language of the dialogue is already latent in the endeavor of raising the question of what the dialogue is all about in terms of that language of a monologic nature. The trouble is that the language of the dialogue would come to constantly destroy the language of the monologue. This difficulty is already hidden in language itself, not in issues we are going to talk about in language [8]. In fact, second-person description or dialogue cannot be subsumed under the umbrella of third-person description or the monologue controlled by the single descriptive author while it can remain durable. At issue is the difference of temporality between second- and third-person descriptions.

Temporality latent in third-person description does coherently integrate both the invariable descriptive context and the linguistic exercise of following the sequential development of the discourse. This scheme certainly remains legitimate in the practice of doing empirical sciences. Insofar as the results of empirical observations by the empirical scientists are referred to and registered descriptively in the perfect tense, their reference in the present tense is unquestionably acceptable as a means for the evidence-based enterprise accessible in third-person description. The record registered in the perfect tense remains undoubtedly invariable even if it is referred to in the present tense by the external observer. In fact, the invincible advantage of doing empirical sciences upon evidence-based discourses compared to philosophical musing is in its capability of securing the invariable context of a descriptive object. The evidence-based context can remain immune to the sequential development of the consequential discourse. This immunity of the invariance to the sequential exercise of the discourse origin is not conceivable in second-person description.

In contrast, the advantage of practicing whatever discourse in second-person description is in its capacity of being able to refer directly to concrete particulars as practiced in the mold of measurement dynamics available to the empirical world. Insofar as the measured consequences to be registered in the perfect tense are concerned, they could certainly serve as the reliable references for practicing empirical sciences with use of the intervening third-person description. However, the capability of a second-person description latent in the measurement dynamics of a concrete particular nature is more than that of third-person description while it remains less definitive. It can tolerate some extent of incongruences or inconsistencies in the making that are constantly responsible for inducing the following measurements to come, while there remains no room for tolerating such inconveniences in third-person description [9]. The uniqueness of second-person description is found in the temporality of a generatively variable nature that is durable, as exhibiting a sharp contrast to third-person description observing the temporality of preserving an invariable context of a descriptive origin.

What is unique to second-person description is the participation of multiple agents imputed to the natural occurrence of the dichotomy of any material participant and its covering environment. Although it remains passive to its own environment, each participant can become active towards any other participant as functioning as the constituent member of the environment to the latter. Each participant is both passive and active depending upon the perspective to be taken. This co-occurrence of both passivity and activity cannot be tolerated in third-person description because the only active agent permissible there is the descriptive author involved in the monologic discourse. Furthermore, once the interplay among the multiple agents has been registered in the

finished record, no agency is allowed within the record since it is addressable in third-person description. Nonetheless, it remains unavoidable to address what second-person description is all about in third-person description just as we are now committed ourselves to doing so in the present article.

One emergence measure for us to try to save second-person description in the face of third-person description being critical in observing the integrity of the finished record is to refer to the capacity already latent in the second-person description for leaving no inconveniences behind in the record. Nonetheless, second-person description has the capacity of tolerating inconsistencies internally at the present moment of Now, which is inconceivable in third-person description. The uniqueness of temporality associated with second-person description is found in transferring the incongruent mixture of both passivity and activity constantly forward. This constant forwarding of the internal inconsistencies is not addressable in third-person description, while it is indispensable for the wellbeing of the latter after the events.

One specific example demonstrating the uniqueness of second-person description compared to third-person description will be seen in a possible dialogic exchange between any pair of agents or discussants as figuratively embodied in the linguistic exchange of narratives. Exchanging my own stories between the participants of any kinds underlies second-person description. In the dialogical situation between any two parties, the rule applied there is that one party always monopolizes the chance of having a say on the scene while letting the other party listen to the one succeeding in grabbing that chance first. Taking turns at speaking is the rule adopted there. Even if the listening party is ready to start speaking, he would have to give up grabbing the chance for a moment once he finds the other party is faster in grasping the chance of starting speaking. That is retrocausal for the would-be late starter with respect to dismissing his prepared readiness of having a say for a while [10,11]. The listener going to take turns at speaking is to act for the present in the perspective viewed from the immediate future in the hopes of actually being able to take turns. That is to say, the listener is going to act in the immediate future for the sake of revising the present currently being shaped by the preceding speaker. Retrocausality is conceivable only when the present is open to its further revisions.

On the other hand, there is no such possibility as waiting for and seeking the chance of starting speaking once the discourse framed in third-person description happens to be adopted. The retrocausal action being exclusive to second-person description is unique in acting for the present in the perspective viewed from the immediate future, while the causal action addressable in third person description goes along with determining the tenseless future in the perspective from the present. Of course, the retrocausal action from the perspective in second-person description does not offend the third-person dictum as saying that the past cannot be changed at all in the perspective from the present since it has already been frozen in the record available to the present [12]. The past is an attribute of the verb whose subject has completed some action in an irrevocable manner. The past remains immune to any action from the present. Even errors made in the past remain as being an irrevocable fact in the perspective viewed from the present. In contrast, the present is susceptible to the action envisioned from the immediate future when the present is inclusive of those commitments towards the future that may allow for their further revisions. Thus, errors made in the past can be corrected by the concerned agents at the present in the perspective viewed from the immediate future under the provisional foresight such that their persistence without being attended may not be tolerated any further. Participation of anticipatory agents may make retrocausality irresistible.

The standard norm applied to the practice of doing empirical sciences allows for the contributions prepared by the descriptive authors having only one voice. No allowance is made for likelihood of the belated intervention from possible discussants carrying multiple voices into the finished text of any completed article. The prohibition of such belated interventions is customarily tolerated in the publication in the established discipline of empirical sciences or philosophy unless the article of

concern is retracted for whatever reasons. This is so even if the contributions of the discussants are referable in the section of acknowledgments.

The bottom line is that the material basis of second-person description is sought in measurement dynamics. This is different from state dynamics that should be acceptable especially in physics under the condition that the effort of accommodating state dynamics to measurement dynamics may be suspended. There should be no argument against the proven competency of state dynamics in the physical world so long as the abstract notion called a state is taken for granted in whatever sense. In contrast, measurement dynamics anchored on second-person description would remain extremely clumsy. It cannot take advantage of the likelihood of the descriptive invariant of an abstract nature that state dynamics could enjoy. Put differently, an appraisal of second-person description in third-person description as being attempted right in the present article does require something equivalent to a descriptive invariant that may not necessarily be of an abstract nature.

5. Relating Second to Third-Person Description

One candidate for serving as the nexus concatenating second to third-person description may be to have recourse to referring to probabilities conditioned on the occurrence of the internal observers or agents accessible in second-person description. Introducing the notion called probabilities is equivalent to introducing some agents to whom probabilities may apply. The notion of probability has already been well established and worked out in mathematics framed in third-person description. In addition, conditional probabilities are also conceivable there. Once one pays due attention to them, it would become imperative to secure the participation of an observer that can set and identify the concrete nature of the conditions applied to probability. Of course, a mathematician can serve as a superb agent for setting such a condition to be applied to probability, but the agent setting various conditions is not limited to the mathematician.

What is required for the agents setting conditional probabilities is that the conditional probability of the occurrence of the internal observer itself must be unity. That is equivalent to saying that the internal observer can identify the conditions under which it may become durable. Consequently, if the internal observer happens to occur with probability unity within the framework of second-person description, it could also be referable as the durable agent as a type in third-person description by the external observer. The record available to the external observer could certainly confirm the invariability of the durable agent addressable in third-person description. The internal agent that may be durable could thus assume a dependable role of relating second- to third-person description. The durable agent, which may uphold its own first-person agency referable with use of an index in third-person description, can identify itself as going through second-person description.

In a similar context, a physician can identify the physiological conditions of a patient's wellbeing via an external inspection. The doctor's probabilistic diagnosis prescribed in third-person description certainly relates to the probabilistic physiological conditions maintained by the whole set of internal organs constituting the patient's body relative to the body staying alive and healthy. Since each organ is an agent, the interplay among the participating whole set of internal organs is directly approachable at most in second rather than in third-person description because of the multitudes of the participating internal agents. In contrast, no agents other than the descriptive authors are allowed in third-person description solely on the adopted methodological ground.

Although it may be possible to approach the population of agents in third-person description in terms of a probabilistic distribution, the notion of the population has already been subjected to an abstraction unique to the external observer standing by. The population of individuals may be conceivable only when each individual countable in the same unit remains indistinguishable among them on the methodological ground of an adopted abstraction.

On the other hand, if the notion of probabilities survives in second-person description, it would be imperative to see the participation of a durable agent relative to which the accompanied conditional probabilities may become conceivable. This is in parallel to the persistent presence of a mathematician

who sets the conditions upon which conditional probabilities could be specified in third-person description. Thus, whether the durable agents addressable in second-person description could really be likely must totally be an empirical matter. Once the durable agents have turned out to be factual, they may certainly be addressed in third-person description. Nonetheless, this observation does not entail the occurrence of the durable agents guaranteed a priori theoretically in a manner of being accessible to third-person description. What third-person description can do in this regard is no more than referring to the consequence of the durable agents registered in the record. The registering agents are the durable agents themselves approachable in second-person description.

At issue must be how to figure out the occurrence of such durable agents strictly on the empirical ground. The role of the language here is simply in pointing to the durable agents already materially substantiated. One necessary condition for this task is that it is required to refer to some technical term of our linguistic origin that can have an indexical capacity pointing to something else. One typical example is something called temperature, which has been well established in the discipline called thermodynamics. What is specific to temperature is the indexical capacity of a material unit, sometimes called a thermometer, experiencing the environment it meets. While it may also be taken as a symbol representing the material context in thermal equilibrium, temperature can be more than simply being a symbol if the mixing up of both the usages, either as an index or a symbol, in an undisciplined manner happens to be avoided. In any case, both the merit and demerit of the technical terms adopted in empirical sciences may be found in the coexistence of both the symbolic and indexical implications in the same terms.

When we say that there is a dichotomy of a material participant and its covering environment in the quantum regime, it could also follow that the environment has the capacity of identifying the participant as its constituent member. The material means for such identification could be transference of the intervening quantum particles. Likewise, the participant experiencing its environment may come to interchangeably measure the temperature of the environment origin through its built-in indexical capacity. Each one of the dichotomies of any material participant and its covering environment thus comes to assume the agency of measuring the other. In order to proceed further, it would be required to figure out how the durability of the internal participant could be substantiated in the first place. After all, the covering environment comes to consist of such durable participants in the effect. What is required for the likelihood of those internal agents must be the material capacity of integrating both thermodynamics and quantum mechanics in a congruent manner [7].

At issue is the physical likelihood of second-person description required for addressing the interplay between thermodynamics and quantum mechanics. This inevitable recruiting of second-person description is due to the empirical fact such that both any material participant and its covering environment are the internal observers with use of measurement internal to each of them.

Internal measurement to be practiced by the participating agents thus comes to possess a unique temporality. When one agent measures any other one, the tense of the measuring agent differs from that of the agent to be measured. While the act of measuring is in the progressive tense, the tentative object to be measured must be registered in the perfect tense. What remains most primitive to internal measurement is its cohesive capacity of both generating and bridging the gap between the perfect and the progressive tenses [13]. Internal measurement is temporally cohesive in pulling the quantum particles from the body to have been measured into another body going to measure the counterpart. That generative and coordinative capacity extending over to different tenses, that is agential, is foreign to third-person description to be practiced strictly in the present tense.

The intrinsic affinity perceivable between internal measurement and second-person description is found in that both can exercise the capacity of concatenating the progressive to the perfect tense; that is, the temporality unique to second-person description, rather than to third-person description. Second-person description is in fact peculiar in distinguishing between the speaker and the listener. The speaker involved in the act of speaking is accessible in the progressive tense, while the listener who is attentive to what the speaker has spoken so far is alert to the speaking act registered already in

the perfect tense. Moreover, the listener going to respond to the incumbent speaker would assume the role of the subsequent speaker if the chance happens to become available. There is an intrinsic affinity acting between the speaker and the listener while there is no such affinity available to third-person description. The alternation of the role of the discussant from the speaker to the listener and back is common in second-person description, while the speaker assumed by the single descriptive author having only one voice remains invincible in third-person description.

The descriptive author for any third-person description would have to be the durable dominant speaker abstracted from the underlying second-person description, as epitomized in the Kantian transcendental Ego. This abstraction of an invincible descriptive author does allow for no interruption from the possible listeners or critics during the act of developing the very discourse. Imperative to the present endeavor for grounding the durable descriptive author upon second-person description must thus be to point to the material capacity of harboring the internal agents with use of the indexical competence of our language. What is intended here should be to seek and then salvage the descriptive author from the durable internal observers that are at home with second-person description.

While practicing the indexical use of our language is first attempted in third-person description as we do in the present article, this attempt certainly differs from the symbolic use of our language [14]. Both the advantage and the disadvantage of symbols in language are found in that they can stand alone without recourse to any indexical means. The symbols can easily allow for their syntactic integration in a tenseless manner through their symbol manipulation as markedly demonstrated in the discipline called mathematics. Nonetheless, they remain indecisive and indefinite in relating themselves to the corresponding counterparts appearing in the empirical world.

In contrast, the indexical use of our language presumes participation of the authors who can relate themselves to something else out there, even with use of indexical reference alone while without recourse to symbolic reference. Furthermore, the relational capacity would not be limited to the language users like us. If the occurrence of the internal agents becomes likely with the indexical use of our language, the agents would also turn out to carry the indexical capacity of relating themselves to something else in the neighborhood. The indexical use of our language may be open to the potential for approaching the indexical activity of material origin as demonstrated in the operational procedure in the manner of faithfully following the written manual of an experimental protocol.

The outcome would simply be a self-consistency between the indexical capacity of our language user as a premise and that of the internal agents as a derivative. A common denominator is that both the language user like us and the internal agents to be derived are indexical in exercising their capacities. Then, the self-consistency would come to successfully be met and closed once we would admit that our language user could be a case of the derivable internal agents, though going through a long winding detour of a somewhat extraordinary nature. The detour is going to require first to start from second-person description as focusing upon the indexical capacity of material origin, then being followed by the indexical usage of third-person description, and finally to reach the first-person agency that can eventually be symbolized as a type. Of course, this observation has nothing to do with hailing the anthropocentrism. What may look like a metamorphosis of anthropocentrism is no more than an appreciation of the indexical activity of material origin.

An impending issue must be how to figure out the likelihood for the internal agents strictly on the material ground in which the role of our language is limited to its indexical use. A likely case in point may be chemical reactions available and ubiquitous in the empirical world since chemical affinity latent in reacting molecules is already indexical in finding and reaching the likely reaction partners.

6. Addressing Chemical Reactions in Second-Person Description

Chemical affinity is most evident in the contrast between any reactant molecule and its environment. When the parlance of quantum measurement is employed here, the detection of a reacting molecule by the environment is followed by the precipitation of the reaction product. That is in fact a consequence from setting up the quantum correlation as a prerequisite for upholding the

measurement being realizable between the reactant and its environment. Setting up the quantum correlation is naturalized in chemical reactions.

Quantum measurement being ubiquitous in the material world of chemical origin is certainly a consequence from the intrinsic affinity acting between any reactant to be measured and the natural measuring apparatus of the environmental origin. Measurement of the environment origin is thus indexical in identifying the reacting molecule that can form a quantum correlation with the natural measurement apparatus available there in a bottom-up manner.

A typical example of such a formation of quantum correlation is the transformation of the initial reactant molecule with the help of the measurement capacity latent in the environment. The quantum measurement is the material activity of recruiting the quantum particles from the reactant molecule to be measured into the measurement apparatus of the environment origin. Accordingly, the synthesis of a transformed molecule thereupon is intrinsically an individual event. When there may be possibly more than one kind of transformation feeding upon the same set of the quantum particles, the most likely transformation to occur must be the one which is the fastest in the resource utilization. There must be no chance left for the latecomer since the quantum particles mediating the process of measurement remain indivisible. It is on a first-come-first-served basis. That is to actualize only the fastest out of the possible while necessarily trimming away the slower counterfactual conditionals without naming them as such explicitly. Of course, this exclusivity to the fastest alternative does by no means imply violation of the principle of linear superposition of the quantum wave functions that could be conceivable all on an equal footing strictly on the theoretical ground. For the likelihood for linear superposition of the wave functions must certainly be envisioned because of the adopted abstraction unless measurement necessarily of an empirical implication intervenes.

The reaction environment to any reactant assumes at least two different roles. One is indexical for identifying the reactant from which the quantum particles are transferred towards the environment as a regulative resource for making a new product accordingly. The other is for the actual material embodiment of the synthesis. What is unique to the interplay between regulation and embodiment is their sequential nature in processing. The material embodiment is to follow the regulation since identifying the material resource to be transferred sets the pre-condition for the embodiment. In this regard, classical mechanics is exceptional in setting both regulation and embodiment in a concurrent manner strictly on the adopted methodological ground.

When the law of motion in the form of an equation of motion is supplemented by its boundary conditions, the regulative means implicated by asking the boundary conditions at the same time is forcibly set to be concurrent with its application to the law of motion. This simultaneous assignment of both regulation and embodiment does not apply to the interplay between the actual reaction environment and any reactant inside there in the quantum realm.

Detection of any reactant by the environment is a material process that takes time. The instantaneous bird's eye view of everything included altogether may be conceivable only to the externalist such as the physicist exclusively on the theoretical ground. This observation limited to the externalist goes along with a reminder saying that third-person description as a dependable means for securing the externalist cannot get rid of the instantaneous bird's eye perspective towards everything. Exactly for this reason, second-person description appreciating a worm's eye perspective comes up to the surface. The internalist involved in second-person description is agential in locally implementing the actual deed for embodiment without presupposing such an instantaneous bird's eye view to the global extent. At issue would have to be how to secure the likelihood of the durable internalist to be precipitated from the environment.

Thus, it is rather ironical to address the agential role played by the environment in third-person description, which sets the descriptive author as the externalist to be acceptable as the sole agent. The obvious fact is that how the environment would come to detect a reactant could be revealed only after the event. The environment takes time for identifying what it is going to detect. The environment in and of itself is in fact agential on the spot because of its capacity of distinguishing between foresight

and hindsight. This agential activity other than that due to the descriptive author is addressable in second-person description, while there is no doubt of descriptive accessibility to the completed consequence in third-person description.

To be sure, the material embodiment of the environment that has been completed remains fixed and global. Nonetheless, the on-going activity of regulation must be local in the sense that there is no regulation extending over to the global extent in an instantaneous manner. Quantum nonlocality may apply to the material embodiment whose regulation has already been completed and registered in the record, but not to the act of regulation right in the making. The act of regulation constantly poses the question of who or what in the world could be responsible for that action at all when, where, and how.

The response to those regulations coming from over the finite perceptual horizon to the internalist as the agent in the second-person status is in the activity of groping in the dark as constantly meeting unexpected surprises. A necessary condition for the likelihood of the agent in the second-person status is its durability even in the face of those inconveniences arising from groping in the dark. The durable agent must be the one that could identify the conditions making it durable as successfully discovering and implementing the scheme of necessary resource intake as outcompeting the counterfactual alternatives.

The dichotomy of any reactant molecule and its reaction environment does however raise a serious question regarding how to grasp the environment. One obvious stipulation is that the environment referred to in the present context is indexical as implying that the very environment as an object referable in second-person description must be durable and referable as a descriptive invariant even in third-person description. That is to say, if the environment is referable in both second- and third-person descriptions, it must be durable when approached in second-person description at the least. Such durable environment can also be referred to as a durable *type* in third-person description. The environment thus has the legitimate capacity of bridging the gap between second- and third-person descriptions. Such an environment carrying the agential capacity is, however, not conceivable in statistical physics addressable exclusively in third-person description. The statistical ensemble, whether it may be micro-canonical, canonical, grand-canonical, or whatever else for that matter, does not carry the agential capacity of changing the physical nature of the ensemble on its own.

The impending agenda is that when the dichotomy of any reactant molecule and its reaction environment is given, how one could come up with the environment that may be durable at least empirically. Crucial at this point is the material likelihood of an agential object referable as a descriptive invariant. This is by no means a theoretical issue addressable in third-person description. One plausible empirical example may be a material organization which can maintain its class identity while allowing for the constant exchange of the individual component elements of the same kinds.

When we use our language as a symbolic means, it would certainly be possible to symbolize the material organization supported by exchanging the component elements with use of a descriptive symbol called metabolism. At the same time, such material organization may look agential when we use the language as an indexical means. If each component element to be exchanged is referred to as an index, the agency of the indexical activity onto the individual component may be sought in nothing other than the material organization that constitutes the environment to that individual.

The distinction between the symbol manipulation and the indexical agency is subtle in the usage of our language, but its implication is decisive and far-reaching. In fact, the symbol manipulation allows for the descriptive author as the sole agent. Nonetheless, the indexical agency that is ubiquitous in the practice of second-person description has the potential capacity for constructing the material object to be symbolized in a bottom-up manner as processing each individual component.

The relationship between second- and third-person descriptions is neither dichotomous nor competitive. Second-person description is inclusive of third-person description in upholding the construction of symbols, which are badly needed for the descriptive enterprise for the latter, in a bottom-up manner. This observation is by no means a theoretical deduction upon an arbitrarily chosen premise, but is no more than an empirical likelihood. In a nutshell, precipitation of symbols

and their syntactic integration conceivable on the verge of the origins of life in the material world, and since then, owes its likelihood to the indexical activities of material origin. We can also make access to such activities with the help of the indexical use of our language. Our effort for vindicating the first-person subjectivity as a symbol is originally sought within the indexical usage of our language in third-person description. In order to proceed further, more concrete explication by way of referring to examples should be in order.

In brief, let us imagine such a case that reactant A is going to be measured by its reaction environment E_A and is transformed into product B as also feeding upon the additional resources available from the outside if necessary. The measurement of A by the environment E_A proceeds through pulling the quantum particles constituting the individual A into E_A and is followed by the synthesis of product B thereof. In a similar vein, reactant B is successively going to be measured by its reaction environment E_B , which differs from E_A , and the synthesis of product C would follow if the synthesis of C is faster than the reversed reaction from B to A and any other competing reactions. As admitting the repetition of the similar sequence, further suppose that product Z is going to be measured by its reaction environment E_Z and the synthesis of A would be followed if it is the fastest compared to the other potential competitors. The net contribution would be completion of a reaction cycle as letting the synthesis of B in E_A cohesive directly to that of A in E_Z located at the remote-end point in the reaction sequence when it is followed along the forward direction, i.e., retrocausal cohesion. As a matter of fact, the retrocausal cohesion propagates backward as pulling in the products already made by the others in the immediate upstream.

The corresponding experimental observation has also been available. In the laboratory setting of the flow reactor simulating a hydrothermal circulation of seawater near hot vents on the ocean floor, it has been made possible to observe the operation of the citric acid cycle even in the absence of enzymes and co-enzymes of biological origin [4,15].

Crucial for the occurrence of the reaction cycle is that the reaction cycle referred to in third-person description at this point is simply an outcome of the construction referable in second-person description. The material embodiment of a reaction cycle could proceed without recourse to its linguistic representation available in third-person description [16]. Identification of the conditions for a likely reaction cycle to sustain its own indefinite duration owes the measurement capacity internal to the cyclic organization, which is itself accessible in second-person description. Furthermore, robustness of the organization may be thanks to each reaction step constituting the cycle that can steadily hold itself through the first-come-first-served basis for the necessary resources exploitations as trimming off the slower counterfactual conditionals.

There is no agent claiming for the bird's eye perspective of the whole reaction cycle in the operation accessible to second-person description. What is possible on the spot, on the other hand, is the indefinite spilling over of the dichotomous processing of any reactant and its reaction environment. The reaction environment may transform the previous reactant into a new one that can again serve as a new component for updating the reaction environment subsequently. The update may be repeatable ad infinitum unless disturbed otherwise. Emergence of a reaction cycle could be a natural consequence of updating the reaction environment from within. Second-person description is unique in implementing its temporality through the agential activity of updating. Repeated updates of the quantum correlation required for the quantum measurement underlies the durable reaction cycle in the temporality allowed for second-person description.

7. Naturalized Temporality

When one wants to figure out the nature of temporality addressable in third-person description in the present tense, it would turn out to be obvious that the temporality is already subjected to a specific stipulation. The notion of Now as the agency of coordinating and integrating different tenses within the descriptive object is forcibly marginalized in third-person description in the present tense. The now point, even though conceivable in third-person description like a mathematical point

on a one-dimensional line, cannot be part of the temporal continuity, but rather serves at most as a boundary between successive parts of the continuum. Addressing the interplay between the different tenses conceivable within the descriptive object goes beyond the competence of the descriptive means limited to the present tense. Syntactic integration practiced in third-person description remains tenseless in the sense that once the integration has been completed, it remains non-temporal.

A typical example of such a tenseless integration is found in the standard practice of doing physics. Once one takes the global space-time coordinate system for granted, as is often the case with physics, the Now can find no room allocated for itself within the given coordinate system. As a matter of fact, the Now is punctual in distinguishing what has been completed. At the same time, it is also open and continuous to what is going to happen. The Now is specific in constantly updating its own agential capacity of making a distinction, as implying that the Now is the agency of filling the gap between discontinuity and continuity in the temporal domain. The Now is persistently durable in ceaselessly updating its concrete contents, while it is punctual in distinguishing the perfect tense from the progressive tense about its each content. Alternatively, each tense of the past, present, and future is no more than an abstraction from the Now. The eternal Now could thus survive unless the constituent concrete particulars are taken over by an abstraction.

Insofar as the space-time coordinate system is fixed, on the other hand, there must be only one clock to be read out as a reliable standard reference. The role of such a reliable clock is to let the time-coordinate to be assigned to whatever moving body be definitive all through the coordinate system. In fact, the time-coordinate is a remarkable artifact exercising the brutal force for letting us easily conceive of both the continuous flow of time and its discrete punctuation anywhere on it without giving any further physical justification. Once the time coordinate is introduced, the issue of letting an instant come to terms with duration or the Aristotelian aporia on how to obtain consistency between discontinuity and continuity could totally be dismissed simply by declaration. This has been a major issue of the Einstein–Bergson public debate in 1922 in Paris [17]. In fact, there is a significant difference between an actual temporal punctuation on the concrete level practiced by whatever agents accessible in second-person description and a meta-level punctuation anywhere on the time coordinate easily imaginable and acceptable to the physicists in third-person description [18].

A merit of the meta-level punctuation is found in that it presumes the flow of time beforehand as dismissing the Aristotelian aporia simply by decree. Instead, the agential punctuation comes to yield the flow of time only in the effect after the punctuational events as processing different tenses at the moment of Now. In fact, there is no likelihood for the Now as the agency for coordinating and integrating different tenses to emerge in the single coordinate system lacking tense attributes. There should be no need there for worrying about whether a given time point belongs to either the past, the present, or the future.

The absence of the Now also applies to two different coordinate systems in which one is moving relative to the other under the reliable empirical constraint such that the speed of light remains invariant whichever coordinate system may be focused. If one coordinate system is moving almost near at the speed of light relative to the other system at rest, the clock proper to the fast-moving system comes to proceed extremely slowly compared to another clock proper to the one at rest. There is no need of referring to the Now for the comparison. The issue of the Now remains irrelevant even in the present relativistic framework of the space-time coordinate systems when the allowable agent is limited exclusively to the single descriptive author who must be the physicist.

On the other hand, the issue of the Now would become most acute and relevant once more than one agent can intervene on the scene. It would become a serious matter to ask whether your Now and mine are the same when both of us are a bit separated in space. The difference between the Now of yours and mine reveals more than what the relativity of simultaneity would imply. At issue should be the concrete empirical contents of each Now.

To be sure, the relationship between the regulation initiated by one party and its perception by another party in the neighborhood is necessarily sequential rather than being simultaneous

since nothing propagates faster than light. It is thus common to observe: “You do not yet receive my message that I have just sent out to you.” If the message is a proposal of the delay of the appointment of a meeting, I would have to adjust and update my previous schedule already set accordingly. The second-person description addressing the adjustment of a meeting appointment thus accommodates itself to a peculiar temporality to which third-person description controlled by the single descriptive author remains incompetent in properly coping with. That is a revision of the previous commitment that has already been done.

The moment of the Now specific to the practice of second-person description is unique in maneuvering its capacity of letting different tenses be invited to meet there for their mutual adjustment. That is retrocausal in the respect of revising the present in the perspective envisioned from the immediate future. Of course, the present appraisal of the retrocausality unique to second-person description does not offend Kantian causality attempted in third-person description in any sense of words in the service of guarding the intended transcendental epistemology. Kantian causality set as a metaphysical pre-condition for making our experiences comprehensible for us may remain invincible insofar as the single descriptive author dubbed as the transcendental Ego can monopolize the practice of third-person description [19].

In a nutshell, retrocausality is to second-person description what causality is to third-person description. Retrocausality is dialogic while causality is monologic. Retrocausality is empirical while causality is metaphysical. Praising retrocausality in third-person description is an oxymoron, whereas retrocausality of itself is legitimate and ubiquitous in second-person description. It is thus the rule rather than the exception for one agent to nullify or disqualify the previous commitment as facing the updated commitments by the others in second-person description. Instead, there should be no such revision of the commitments allowed for once completed by the single author in third-person description [12].

The past cannot be changed nor acted upon in the present in third-person description since it has been registered in the record that is referable in the present tense as already being completed and frozen there. Nonetheless, the present can be acted upon in the perspective viewed from the immediate future in second-person description [18]. In the dialogic exchange, the utterance completed by one party at the present moment of Now turns out to be the reference that is going to be followed and addressed by the other party in the immediate future. The dialogic exchange is thus unique in integrating the utterer and the follower in a somewhat coordinated manner even though they live in different tenses at the present moment of Now. The follower is constantly following what the utterer has uttered. What is more, a pressing issue at this point will be a possibility of making our experiences more comprehensible as referring to the service of second-person description.

The relationship between second- and third-person descriptions is by no means antagonistic. If there were no use of referring to second-person description, the time-honored practice solely with use of third-person description in any theory would lose nothing by dismissing the potential role to be assumed in the body of second-person description. The obvious fact, however, witnesses just the contrary. If one can find a durable agent as practicing our language in the mold of second-person description, it may make access to a harbinger of the descriptive author acceptable to third-person description because of the invariable durability of its identity. Precisely for this reason, the issue of the origins of life would become decisively relevant here. The focus of attention would have to be on the likely emergence of durable agents through practicing our language in second-person description as having recourse to the indexical use of the language alone.

Although it may look plausible and also attractive to address naturalized temporality in third-person description in the present tense [20], this attempt would end up with a metaphysical exercise at best or self-defeating at worst. Metaphysics does not require factual evidence for its own sake even though the chance to be supplemented with supportive factual evidences, if any, must be most welcome.

When the descriptive object carries some implication referable in the tenses other than the present tense, referring to tenses other than the present tense in the present tense is inconsistent unless being supplemented with the additional present tense on the metaphysical level. Although one can admit the noun “yesterday” as the predicate referable in the present tense, the subject “yesterday” carries a multitude of the concrete contents unique to the past tense. Of course, we can say “Yesterday’s tomorrow is today” in the present tense as a meta-level predication of the predicates of yesterday, today, and tomorrow. Despite that, no meta-level discourse can directly touch upon the empirical concreteness. One drawback with third-person description is to mix up both concrete-level and meta-level discourses quite easily in an undisciplined manner.

It then turns out to be obvious that the concrete content of each of yesterday, today, and tomorrow is about memory, experience, and anticipation, respectively. Admittedly, though, we cannot say “Memory of an anticipation is an experience” on the concrete or token-reflexive object-level [21,22]. There should be no likelihood of conceiving of the tense-sensitive temporality within the framework respecting the tense-insensitive temporality limited to third-person description exclusively in the present tense.

It is one thing to advocate naturalized temporality in third-person description on the metaphysical level, but is quite another to justify it on the physical or empirical level. Metaphysics would remain equivocal at best so long as its evidence to be sought on the empirical ground remains uncertain. Likewise, it would be of no use to charge tense-less nature of the physical world simply as being metaphysical on the ground of seemingly naturalized temporality addressable in third-person description. No conflicts between two competing metaphysics can be removed by introducing the third metaphysical alternative. Appraisal of naturalized temporality on the empirical level can be saved and found in the practice of second-person description that is tense-sensitive.

8. Either Tenseless Time or Tenses

An essence of the Einstein–Bergson debate in 1922 is on which is more appropriate to start with, either tenseless time or tenses, for addressing empirical issues. Einstein rejected the priority of tenses advocated by Bergson as saying that Bergson does not know physics, whereas Bergson charged that Einstein in favor of the priority of tenseless time must be a metaphysician [17]. The aftermath of the debate has still been reverberating even now under the rejuvenated guises. One might conceive of the likelihood of the internal observers to appear in the empirical world if it can be modeled as part of a huge block universe admitting only tenseless time. However, this effort is self-defeating. The initial premise of tenseless time is negated by the consequence of the emergence of the internal observers acting as agents which are competent in distinguishing between different tenses.

If the internal observer capable of gathering and utilizing information is likely in the totally closed block universe of quantum mechanics, some additional assumptions in favor of raising a quasi-classical domain amenable to the act of measurement would have to be called for [23]. One relevant issue requiring further scrutiny must be how both the unitary quantum dynamics and measurement of single outcomes could meet Born’s probability rule. In particular, whether the initial premise of tenseless time conceived in quantum information could survive may still remain unsettled when the internal observers, such as the Wigner’s friend or friends in the laboratory, are additionally allowed to intervene in the process [24].

A similar charge would also apply to the classical example of Maxwell’s and Boltzmann’s Stosszahlansatz or the hypothesis of molecular chaos in the gas as employed for precipitating statistical mechanics out of mechanics. The backbone of mechanics is sought within the block universe model admitting only tenseless time. The hypothesis of molecular chaos is about a negative expression of the agential capacity latent in each molecule in the gas, implying that each molecule loses the memory of all the past collisions with the others except for only the most recent ones. Again, the initial premise of the tenseless time supporting the block universe model is negated by referring to the memory being capable of addressing the distinction between different tenses.

If the theoretical hypothesis of agential material bodies additionally introduced into the original block universe model is more than just a theoretical artifact, it would be required to reflect upon the soundness of the initial premise of tenseless time once again. Nonetheless, we may meet an enormous difficulty if it is attempted to address this issue in third-person description being faithful to syntactic integration practiced in tenseless time. It would be of no use to examine the soundness of tenseless time in the discourse already accepting tenseless time. One alternative for circumventing this difficulty may have recourse to second-person description which can allow for the participation of a lot of possible agents distinguishing different tenses from the start. One practical appraisal of second-person description is found in figuring out a workable protocol of conducting *de novo* experimentation, say, for the sake of the study of the origins of life, instead of being involved exclusively in theory alone.

9. Concluding Remarks

The standard tradition of doing empirical sciences duly pays a legitimate attention to observing third-person description. However, this stipulation may sometimes stifle our sincere efforts towards addressing important empirical issues.

One such example is something called consciousness. At the heart of the issue of consciousness is the dichotomy of the conscious being and the descriptive author. The exchange between the two agents may be approached in the dialogic discourse between the two to be practiced in second-person description. If the monologic discourse controlled by the single author were to dominate on the scene, the conscious being that could potentially be conscious of the descriptive author as an invincible counterpart may methodologically and forcibly be dismissed. Third-person description is put under the queer condition of limiting the conscious being only to the descriptive authors themselves. The standard practice of doing empirical sciences in third-person description, whether in the classical or the quantum realm, necessarily dismisses the legitimate participation of the experiencing subject as a genuine subject matter. Asking what being conscious is all about exclusively in third-person description may end up in a pseudo-question.

One more example of this sort is something called qualia referring to individual conscious experiences. Again, there can be observed the dichotomy of the two agents, in which one is the conscious being out there and the other one is the descriptive author who is curious to know what consciousness is all about.

The common agenda must be how to vindicate the emergence of durable plural agents of whatever kind, in which one agent at the least is the descriptive author. The supporting descriptive vehicle could be second-person description that our language can afford in its latent potential. In other words, it may be conceivable to imagine some experimental procedure for raising a material organization which can identify the condition for making itself durable from within. If the protocol of such an experimental procedure is likely to be implemented linguistically, the outcome could be to accommodate the indexical usage of our language to a naturalized empirical outfit of material origin.

Our appreciation of second-person description on the empirical level may be approachable through the indexical usage of our language. Even physics could already be implicitly experiential enough in admitting the indexical activity arising from the material activity of specifying and identifying initial-boundary conditions from within. A decisive issue in this empirical endeavor is how to reach the threshold beyond which the indexical scaffolding of our linguistic origin could naturally be made conducive to emergence of the material organization durable on its own indexical activity. That is a naturalization of second-person description, which abides by the standard protocol of doing experiments. The origins of life approachable on the empirical basis must be the most significant instance among those alternatives indicating the competence of second-person description to be naturalized.

An advantage of second-person description in the practice of empirical sciences is to skillfully circumvent an Aristotelian difficulty of ameliorating the gap between instant and duration to which the standard third-person description is inescapably vulnerable.

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