On the Universality of Performance and the Singularity Nature of Time

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Abstract

This article presents a new approach to the study of time. It involves the direct application of performance theory to the physics field, in which nature itself is modelled as a naturally occurring productive system. Through the agency of the utility of input resource, productivity of process performance equation[1], nature modelled as a productive system is shown to require a unique *time singularity* as its basic transfer function. Consequently, it is also shown that this time-singularity transfer function enables nature to be an ongoing generator of time (a natural oscillator), not only allowing all entities within the universe to exist in time but also allowing oscillatory *time itself* to be the basis of all such existence. Hence, this article clearly aims to present and prove the hypothesis that *all entities in the universe have the exact same nature in time as time itself*, and therefore,

'All things are of the singularity nature of time.'

On the universality of performance and the singularity nature of time

This study presents various arguments and other evidence regarding the legitimacy of its claim that *all entities in the universe have the exact same nature in time as time itself and, therefore, all things are of the singularity nature of time.*

This article is organised under the following four categories of progressive proofs.

A: Performance theory and the omnidirectional nature of time (utilising the utility of input resource, productivity of process performance equation):

The utility of resource 'Mu' (μ), productivity of process 'Eta' (η) performance equation[1] $P_p = \mu\eta$ is shown to be a universal performance measure useful in measuring the performance of any productive system (natural or synthetic) of general form $\mu\eta = 1/\eta\mu$. This performance measurement is shown to be equally valid when measuring performance either in any *forward-time* sense $\overrightarrow{P_{p=\mu,\eta}} = \vec{\mu}\,\vec{\eta}$ or in any *reverse-time* sense $\frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = (\overleftarrow{P_{p=\mu,\eta}})^{-1}$.

Therefore, this bidirectionality property of a universal performance measurement is suggestive that *time itself* must (at a minimum) also be *bidirectional in nature*. This is based on the simple premise that *all things in nature exist within a realm of time*.

B: Mathematical–Physical evidence of the singular nature of time (utilising the Planck equation):

Planck's relationship $E = hf$ is called upon as prima facie evidence of a 'mathematical–physical' relationship that, when combined with the results of Section A, leads to proof that a single timeline is a bidirectional entity of nature and that such bidirectionality results directly from the existence of a *time singularity in nature of form* $\emptyset_{\pm it}$ $=(\pm it).^{-1}$

C: Physical–theoretical evidence of the singular nature of time (utilising the physics of the identified time singularity $\emptyset_{\pm it} = (\pm it)^{-1}$ itself):

Utilising the physics of the identified time singularity $ø_{\pm it}$ $=(\pm it)^{-1}$ itself, subsequent predictions of a cause–effect nature are made of entity performance measurement in an omnidirectional oscillatory time field $(\pm it).^{-1}$ The subsequent nature of the projected universal time field is investigated and expected performance behaviours (predictions) of entities acting within the time field are made. This leads to the fourth and final section of the article.

D: Experimental evidence of the singular nature of time (from three causality experiments: mirror inversion, film inversion and positron annihilation):

Experimental investigations of the results of Parts A and B and the forecasts (predictions) of Part C are fully undertaken with respect to the existence in nature of a time singularity of form $ø_{\pm it}=(\pm it)^{-1}$. Of the three experimental investigations presented, the first two are simple to demonstrate (and replicate) home-style investigations, whereas the third experiment is reported from the literature (circa 1933)[2]. All three experiments show that a *singular* transfer function of form $ø_{\pm it}= (\pm it)^{-1}$ is all that is needed to fully explain all results. Therefore, this study concludes this same transfer function is the essence of all of time itself and is the basis for the existence of all entities within and of this universe.

Hence, this study aims to present and prove the hypothesis that *all entities in the universe have the exact same nature in time as time itself,* and therefore,

‘*All things are of the singularity nature of time*.’

This article concludes with a summary of major findings to date and is followed by a brief discussion of how this singularity of time discovery can lead to further areas of research that could, in and over time, possibly result in the development of a new *time singularity physics* based solely on *the singularity nature of time*. That is ‘$(tsp)^{-1}$’.

Background

Historically, Newtonian physics treated space and time as two standalone components of a passive background to the given existence and movement of objects in time and space. It was not until Minkowski[3] encouraged Einstein in the early 1900s to integrate space and time into a single entity (known as 'space-time') that any further progress was made in the treatment of 'time' as a concept in nature. Unfortunately, it is apparent little further progress has been made in the subsequent 100+ years since Einstein proposed the concept of 'space-time' to better understand and define the exact (Newtonian) standalone feature and nature of what we all still call 'time'.

A: Performance theory and the omnidirectional nature of time (utilising the utility of input resource, productivity of process performance equation)

Performance theory essentially deals with a study of the 'doing of work'. That is, it is concerned with the utilisation of energy in the doing of work and hence has a strong natural fundamental connection with the physics field. Performance is also based on the principal of causality[4]. This is because performance directly relates known cause events (inputs) with measured effect events (outputs) in a forward-flowing (temporal) timeline sense.

Productivity is also a ratio measure of the cause–effect relationship (causality) of events in time. The basic definition (≜) of productivity is a direct ratio measure of effect and cause:

$$\text{Productivity} \triangleq \left[\frac{\text{Effect}}{\text{Cause}}\right] \tag{1}$$

Equation (1) can also be 'collapsed' into a lower state form of $[\text{Cause} \rightarrow \text{Effect}]$ as illustrated in Figure 1. This figure shows the basic structure of a *productive system* with inputs *i* (which are the time-like measurable cause-time events) producing follow-on outputs *o* (which are the resultant time-like measurable effect-time events).

Thus, Figure 1 clearly shows the input–output causality relationship inherently characteristic of any productive system. Often, measures of cause are parametrised as input(s) i and, similarly, measures of effect are parameterised as output(s) o. Therefore, this enables the formulation of the productivity of process function 'Eta' (η) to be stated as the following ratio measure:

$$\text{Productivity of process function } \eta \triangleq \left[\frac{\text{Effect}}{\text{Cause}}\right] = \frac{o}{i} \tag{2}$$

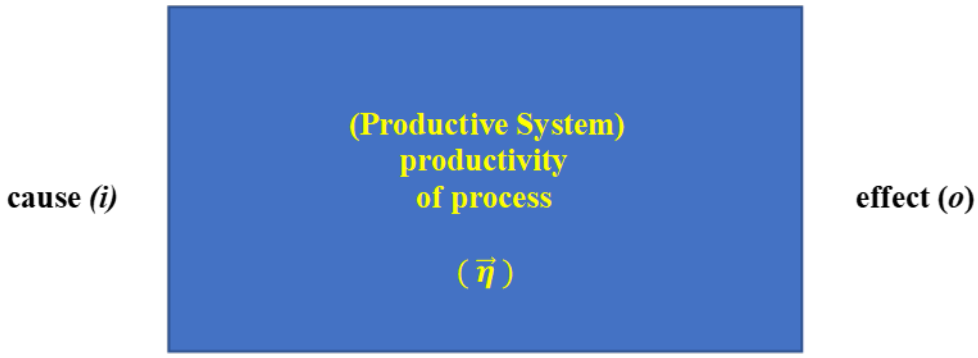


Figure 1. Causal basis of the productivity of a productive system

Equation (2) is read as the *productivity of process* and gives a ratio measure of the amount of output produced by a productive system from a single unit of input resource(s). The *higher the productivity* of the process, the *more efficient* the productive system is deemed to be.

A similar measure of performance is the reciprocal measure $(\eta)^{-1}$ of productivity called the *utility of input resource(s)*. That is, $(\eta)^{-1}$ is defined as the utility of the input resource(s) function 'Mu' (μ) of the productive system and is given by

$$(\eta)^{-1} \triangleq \mu = \frac{i}{o} \tag{3}$$

Thus, Equation (3) is read as the *utility of input resource(s)* and gives a ratio measure of the amount of input resource(s) required (by the productive system) to produce a single unit of output(s). The *lower the utility of the input resource(s)*, the *more effective* the productive system is deemed to be.

In general, a combination of the utility of input resource and the productivity of process measures can be incorporated into a single, naturally occurring measure of the overall utility of input resources, productivity of process performance of the productive system as a whole. That is,

$$P_{p=\mu,\eta} = \mu\eta \quad (4)$$

where the subscript p is defined as the *parameter of interest* of the performance measure P_p.

For example, the parameter of interest can be either the utility of input resource(s) $p = \mu$, or the productivity of the process $= \eta$. Usually, it is desirable to either *minimise* the utility of input resource(s) required (μ_{min}) or (equivalently) to *maximise* the desirable productivity of process (η_{Max}). With the performance measure being formulated as $P_{p=\mu,\eta} = \mu\eta$ *also reflecting the physical structure* of the productive system (as a whole), the one and same formula will give the following result for either type of set goal. For the set goal to be ($\boldsymbol{\mu_{min}}$):

$$P_{p=\mu_{min}} = \frac{\mu_{min}}{\mu_a} \quad (5)$$

where μ_a is a measure of the actual utility of input resource achieved. Hence, if actual (measured) μ_a is less than μ_{min}, then superior ($P_{p=\mu_{min}} > 1$) system performance has been achieved. If μ_a is equal to μ_{min}, then expected ($P_{p=\mu_{min}} = 1$) performance has been achieved and, if μ_a is found to have been greater than μ_{min}, then the productive system has exhibited poor performance ($P_{p=\mu_{min}} < 1$). Similarly, for the alternate set goal of (η_{Max}):

$$P_{p=\eta_{Max}} = \frac{\eta_a}{\eta_{Max}} \tag{6}$$

where η_a is a measure of the actual productivity of process achieved. Hence, if actual (measured) η_a is greater than η_{Max}, then superior ($P_{p=\eta_{Max}} > 1$) productivity performance has been achieved. If η_a is found to equal η_{Max}, then expected ($P_{p=\eta_{Max}} = 1$) productivity performance has been achieved and, if η_a is found to have been less than η_{Max}, then the productive system is deemed to have exhibited poor productivity performance ($P_{p=\eta_{Max}} < 1$).

Note: It can be readily seen that there is a *naturally occurring reciprocal* relationship between Equations (5) and (6), as follows:

$$\frac{\mu_{min}}{\mu_a} = \left[\frac{\eta_a}{\eta_{Max}}\right]^{-1} \tag{7}$$

where use of has been made of the defining Equation (3): $(\eta)^{-1} \triangleq \mu = \frac{i}{o}$.

Hence, it can now be seen that there must be a *naturally occurring inverse relationship* between the two performance measures of Equations (5) and (6):

That is,

$$\left\{ \begin{array}{l} P_{p=\mu_{min}} = \left[P_{p=\eta_{Max}}\right]^{-1} \\ \\ P_{p=\eta_{Max}} = \left[P_{p=\mu_{min}}\right]^{-1} \end{array} \right\} \tag{8}$$

and

Further, the utility of input resources, productivity of process performance measure has *causality automatically built in.* That is, the utility term (μ) is made to naturally *precede* the productivity term (η) as initially used in Equation (4). That is, input resources (μ) must be made available *before* any production (η) can occur.

Last, it is noted that each μ and η measure also has a time directionality 'built in' to the measure because of the way in which such ratio measures have been defined. This is illustrated in Figure 2 where the time-flow, action-relationship between the input(s) i and the output(s) o is understood to occur within each measure:

$$\mu = \frac{i}{o} \qquad \eta = \frac{o}{i}$$

Figure 2. Time directionality of inputs to outputs shown to be automatically built into utility of input and productivity of process ratio measures

Hence, the unique combination of μ and η in sequence not only effectively defines the logical flow (*causality relationships*) between all input and output sequenced resources within the productive system, but also defines the *complete structure* of the same as a '$\mu\eta$-type' system that *naturally* exhibits $P_{p=\mu,\eta} = \mu\eta$ as its *all-encompassing ongoing measure of utility of input resource, productivity of process, whole-of-system, performance measure*.

Hence, the all-encompassing performance measure $P_{p=\mu,\eta} = \mu\eta$ can now be fully *time-flow* defined and described as follows:

$$\overrightarrow{\boldsymbol{P}_{\boldsymbol{p}=\mu,\eta}} = \vec{\mu}\,\vec{\eta} \tag{9}$$

This measure now matches the perceived physical flow direction of input resources and the perceived physical flow-on direction of output resources (as now revealed by use of the symbol ($\vec{\eta}$) in Figure 1).

Multidirectionality of performance measurement

Using the relationship of μ and η as in Equation (3), $(\eta)^{-1} = \mu = \frac{i}{o}$, and the notation $(\overrightarrow{\mu}\overrightarrow{\eta})$ introduced in Equation (9), Equation (3) can also be extended to now read:

$$(\overrightarrow{\eta})^{-1} = \overleftarrow{\mu} = \frac{i}{o} \tag{3'}$$

and hence, Equation (9) can be similarly extended and re-expressed as follows:

$$\overrightarrow{\boldsymbol{P}_{p=\mu,\eta}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} \tag{9'}$$

That is, Equation (9)' indicates that a performance measure of form $P_{p=\mu,\eta} = \mu\eta$ has a *natural time direction* built into it, brought about by the *causality relationships being preserved and embedded into the measure*. In addition, because a *matching performance measure is also shown by* Equation (9)*'* to equivalently *exist simultaneously in the opposite time direction*, it is apparent that the *time-base of the performance measure itself must, therefore, also be functionally bidirectional*.

Last, the bidirectionality of performance measurement is now expressed as follows:

$$\overrightarrow{P_{p=\mu,\eta}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = (\overleftarrow{P_{p=\mu,\eta}})^{-1} \tag{10}$$

According to Equation (10), for any productive system (natural or of human origin) that can be modelled using the concepts of resource utility and productivity of process, the productive system itself results in a structure $\mu\eta = (\eta\mu)^{-1}$, and *automatically* has a bidirectional utility of input resource, productivity of process performance measure of form $\overrightarrow{P_{p=\mu,\eta}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = (\overleftarrow{P_{p=\mu,\eta}})^{-1}$.

Note: Because *each and every performance measure resides in time* (i.e. each and every performance measure is *time-based*), the $\overrightarrow{P_{p=\mu,\eta}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = (\overleftarrow{P_{p=\mu,\eta}})^{-1}$ bidirectional performance measure result implies that *two types of* timeline (i.e. $\pm t$) *must also exist*. Thus, performance measurement is seen to be an omnidirectional entity of universal importance in assessing the utility of resource, productivity of process of any productive system within nature, and indeed, including the whole of nature itself.

However, as impressive as the discovery of the natural existence of a universal (omnidirectional) performance measurement may be, next, the following even more important, basic preliminary conclusion is made.

(Preliminary) Conclusion #1

Because the basic resource of time underlies the very existence of all productive systems in nature, and their universal (omnidirectional) performance measures of type $\overrightarrow{P_{p=\mu,\eta}} = \vec{\mu}\,\vec{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = (\overleftarrow{P_{p=\mu,\eta}})^{-1}$, time itself must be declared an omnidirectional (universal) entity in and of its own right.

B: Mathematical–physical evidence of the singular nature of time (utilising the Planck equation)

‘Nature study’

Recalling Figure 1, ‘input resources’ (i) are clearly understood to cause the observed effect of ‘output resources’ (o) to be generated via the productivity function η of *some* process embedded in *some* productive system *somewhere* in nature. Therefore, that this scenario can act as a (performance-theory-based) model to demonstrate how nature produces all of the things *we encounter and are witness to in our daily lives* is not an unreasonable starting proposition.

Next, it is the task of this performance-theory-based investigation to show that all of this comes about by *the engine of nature being time* and that this *time generator runs on a fuel we call energy*. Of course, time and energy are apparent basic and fundamental resources, respectively, of a productive system we can also all call ‘*nature*’.

Question: What was the very first 'resource' that set all of this in motion? An interesting leading question...

Answer:

Hierarchy of Resources:

Obviously, performance theory has much to state about resources: input resources i and output resources o. However, a very simple question to ask is, 'When, where, how, etc., do all these resources come about?' Time would, of course, have to be close to an answer—simply because *all things* (e.g. productive systems and performance measures) *exist in time*. Hence, 'time' is a 'common denominator' shall we say? Nevertheless, where did time itself come from? Was there an initial input resource to the generation of time? This author suggests that the only possible answer is 'yes', there must have been an initial input resource to the first generation of time and that input resource could only be the *fundamental* resource we call 'energy'.

That is, 'time' might well be a foundational resource—and even a basic resource—but time itself cannot be a *fundamental* resource. That title must go to the resource at the *base of an imagined pyramid of resources* and that resource is *energy.* That is, a pyramid of resources must exist, within which a definite hierarchy of resources must also exist. Thus, the most important resource is *energy,* possibly *followed by time*, followed by...

Question:

Is there a known and accepted physical-cum-mathematical equation that directly relates energy to time such that the situation depicted in Figure 3 might become a reality?

Answer:

No. Both mathematics and physics are silent on any expression of a direct relationship between energy and time. However, there is an expressed relationship between energy and the inverse of time as given by the Planck formulation[5]:

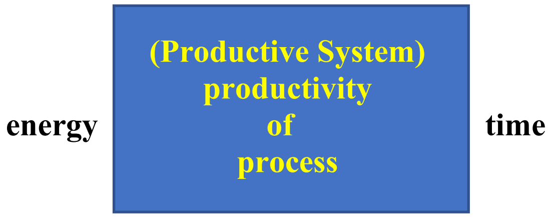


Figure 3. Theorised natural process of the production of time (from energy)

$$E = hf \tag{11}$$

where f (frequency in Hertz as in the number of cycles per second) can be re-expressed as the reciprocal of (seconds per cycle) as in the form *1/t*. That is, Equation (11) becomes $E = hf \; = \frac{h}{t}$, where h is simply the Planck constant (of direct proportionality), which makes the Planck equation the simplest of relationships (Occam's razor) between energy and the reciprocal of time. Now, $\frac{h}{t}$ can be rewritten $h(t)^{-1}$. Therefore,

$$E = h(t)^{-1} \tag{12}$$

is the required *direct* relationship sought between causal energy E and an apparent 'equivalent' effective time of $(t)^{-1}$.

Question:

How does $(t)^{-1}$ in Equation (12) relate to a simple clock time '*t*'?

Answer:

$(t)^{-1} = (it)^{-1}$ where the i in the (it) is not an input resource as depicted in the formulation of Equation (2), *but* the mathematical imaginary (complex) number i as in $i^2 = -1$. That is, Equation (12) can be rewritten as:

$$E = h(t)^{-1} = h(it)^{-1} \text{-} \tag{13}$$

Proof of Equation (13):

Let time $\qquad t = it$

The reciprocal of ***t*** is: $\qquad \frac{1}{t} = \frac{1}{it}$

and, on normalising the RHS: $\frac{1}{t} = [\frac{1}{it}]\frac{-it}{-it}$

giving: $\frac{1}{t} = \frac{-it}{t^2}$

Hence, $\frac{\cancel{t^2}}{\cancel{t}} = -it$

That is, $t = it = -it.$

Hence, $h\,(t)^{-1} = h(it)^{-1} = h(-it)^{-1}$ QED

Thus, Equation (13) now becomes

$$E = h(t)^{-1} = h(it)^{-1} = h(-it)^{-1} \tag{14}$$

resulting in $h(it)^{-1} = h(-it)^{-1}$

That is, $+it \equiv -it$

Thus, *time* is now seen to be a *self-replicating* resource. That is, Equation (14) indicates that once energy *E* first produces an initial time of $+$ *it* or $-$*it*, this time itself has the ability to reproduce itself as time $\mp$*it*. That is,

$$\pm it \equiv \mp it \tag{15}$$

Thus, time is (mathematically) an imaginary, universal entity of ongoing, self-replicating natural form:

$$\text{time} = (\mp it)^{-1} \tag{16}$$

That is, through the derivation of Equation (14), Equation (16) reveals that within the productive system we call nature, an *input resource* of time it, through the equivalent mathematical *process of inversion* $(\ \ )^{-1}$ followed by the equivalent mathematical *process of normalisation*, results in the *output resource* of $-it$ *being created* and forever, vice versa: That is, an input resource time of -it, through the same ongoing mathematical processes of inversion followed by normalisation, results in the output resource it, etc.

This situation can be interpreted as a self-oscillating (i.e. positive feedback) productive system in which a *self-replicating time* of oscillation frequency 'f' is initially produced and thereafter continuously and forever reproduced with frequency 'f'. This frequency is suggestive of being the same *natural frequency* of oscillation embedded within the Planck relationship of Equation (11): $E = h f$, with f being $\frac{E}{h}$ Hertz.

Thus, time is seen to be a *naturally occurring self-replicating entity* of frequency $f = \frac{E}{h}$ Hertz and can be expressed mathematically by the following simple inverse relation:

$$\text{time singularity } \varnothing_{\pm it} = (\pm it\ )^{-1} \tag{17}$$

where $\varnothing_{\pm it} = (\pm it\ )^{-1}$ also meets the condition for utility of resource, productivity of process optimality ($P_{p=\mu_g,\eta_G} = \mu_g \eta_a = \mu_a \eta_G = 1$). The proof follows.

<u>Proof</u>:

If the input (i) time of $\pm it$ produces the output (o) time of $\mp it$ for all of time, then the utility of input resource $\mu = \frac{i}{o} = \frac{-it}{+it} = \frac{+it}{-it} = -1$ and, *simultaneously*, the productivity of process $\eta = \frac{o}{i} = \frac{+it}{-it} = \frac{-it}{+it} = -1$. Thus giving

$$P = \mu_a \eta_a = \mu_g \eta_G = (-1)(-1) = 1 \tag{18}$$

Therefore, a naturally occurring productive system that generates self-replicating time through the agency of a time singularity has *expected unitary performance* where the input and output resources are the same. Such a system can be *classically* viewed as a positive feedback (oscillatory) system with its transfer function given by the expression:

Time transfer function = $\eta(\pm it)$ = time singularity function $\emptyset_{\pm \boldsymbol{it}} = (\pm \boldsymbol{it}\ )^{-\mathbf{1}}$.

That is,

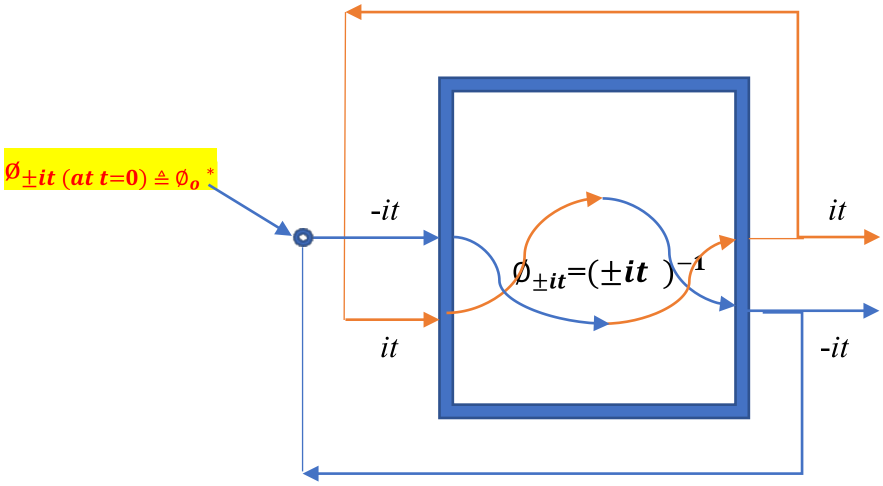


Figure 4. Equivalent positive feedback (oscillator) bidirectional transfer function of time singularity $\emptyset_{\pm it}$

(Preliminary) Conclusion #2

Time is a naturally occurring oscillation that exhibits (as predicted) a continuous and ongoing unity of performance measurement at all times. This result occurs because the time singularity function itself (being simultaneously the utility of input resource function $(\pm it)^{-1}$ *and* the productivity of process function $(\mp it)^{-1}$) has an overall utility-productivity performance measurement expressed collectively as follows:

$$\overrightarrow{P_{p=\mu_g,\eta_G}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

$$\overrightarrow{P_{p=\mu_g,\eta_G}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \emptyset_{\pm it}\,.\,\emptyset_{\mp it} = \emptyset_{\mp it}\,.\,\emptyset_{\pm it} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

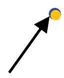
$$\overrightarrow{P_{p=\mu_g,\eta_G}} = (\mp it)^{-1}(\pm it)^{-1} = (\pm it)^{-1}.(\mp it)^{-1} = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

$$\overrightarrow{P_{p=\mu_g,\eta_G}} = 1 = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

C: Physical–theoretical evidence of the singular nature of time (utilising the physics of the identified time singularity $\varnothing_{\pm it}$ itself and the subsequent time field $\pm it$ to make predictions of a universal cause–effect nature)

The structure of Equation (*14*), $E = h(t)^{-1} = h(it)^{-1} = h(-it)^{-1}$, shows that energy E and time *t* are related through the *Planck parameter* h and hence, the *Heisenberg uncertainty principle* can be applied in giving physical meaning to Equation (14).

In particular, if time $\varnothing_{\mathbf{0}}$ were to be defined to be that *very specific time event* at which the time singularity $\emptyset_{\pm it} = (\pm it)^{-1}$ first comes into existence—as shown in both Figure 4 earlier and Figure 5 later (i.e. as time *t* approaches the very specific origin value of zero the energy associated with that event is, therefore, effectively unlimited)—then the unlimited oscillatory time field $\pm it$ must also *instantly emanate* from the initial time singularity event itself $\varnothing_{\pm \boldsymbol{it}\ (\boldsymbol{at}\ \boldsymbol{t}=\mathbf{0})} \triangleq \emptyset_{\boldsymbol{o}}$. That is, the initiation of time and its associated time field generation is now considered the result of the *natural productivity action of an initial point-in-time singularity productive system designated* ‘ $\emptyset_o$’:



$\varnothing_{\pm \boldsymbol{it}\ (\boldsymbol{at}\ \boldsymbol{t}=\mathbf{0})} \triangleq \emptyset_{\boldsymbol{o}}$

Figure 5. The origin of time ($\varnothing_{\mathbf{0}}$) at a very specific ‘point’ in time (marked by)

Furthermore, as illustrated in Figure 6, the origin of time $\varnothing_0$ at marks the action in time of the initial time singularity event $\varnothing_{\pm it} = (\pm it)^{-1}$that subsequently results in the ongoing generation (*projection)* of an unlimited number of omnidirectional field timelines $\pm it$ (i.e. a **time field**) oscillating into and out of and, continuing to do so, forever.

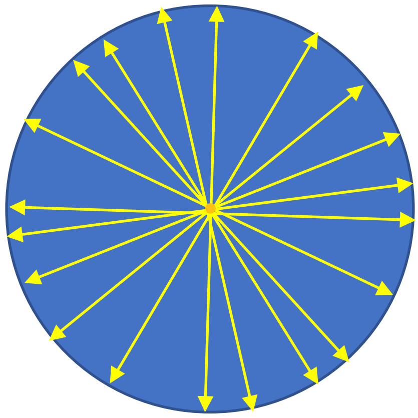


Figure 6. Omnidirectional* time field $(\pm\boldsymbol{it})^{-1}$ initially projected from the origin of time singularity ($\emptyset_0$) and then oscillating at frequency f throughout time as the ongoing action of the time singularity $\emptyset_{\pm it}$ =$(\pm\boldsymbol{it})^{-1}$

Equation (17) for time singularity $\emptyset_{\pm it}$= $(\pm it\ )^{-1}$ can also be interpreted from a simple performance theory perspective. That is, the time singularity function $\emptyset_{\pm it}$ =$(\pm it)^{-1}$clearly is the equivalent productivity transfer function η of the natural time oscillator itself, as illustrated in Figure 7:

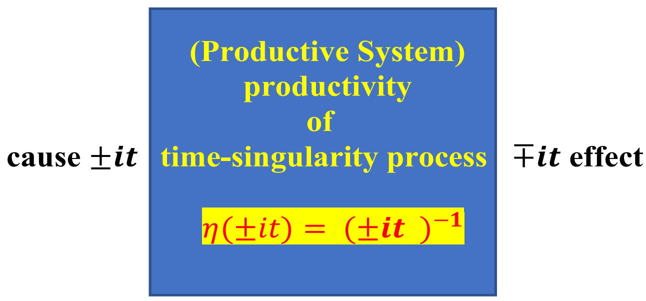


Figure 7. Productive system model of the time singularity [$\emptyset_{\pm it}$ =$(\pm\boldsymbol{it})^{-1}$]

*** Special note: Omnidirectionality effectively means no two individual timelines can ever be truly observed to run parallel to each other.**

Such timelines constitute the time field $(\pm it)^{-1}$. Because each timeline is able to support the existence of (productive system) entities of form, for example, $\pm\, i\chi$, these time-based entities are expected to exhibit the following real-time behaviour:

$$\begin{bmatrix} i\chi = (\,-i\chi)^{-1} \\ -i\chi = (\,i\chi)^{-1} \end{bmatrix} \tag{19}$$

That is, an entity on timeline $+it$ is exactly the same entity on timeline $-it$. This is shown in Figure 8, which illustrates the existence in time of entity $(\pm\, i\chi)^{-1}$on its $\pm it$ timelines.

Performance of entity $(\pm\, \boldsymbol{i\chi})^{-1}$

Any performance measure of $(\pm\, i\chi)^{-1}$ on timeline $(\,\emptyset_0 \rightarrow \emptyset_{it})$ can now be visualised as shown in Figure 9:

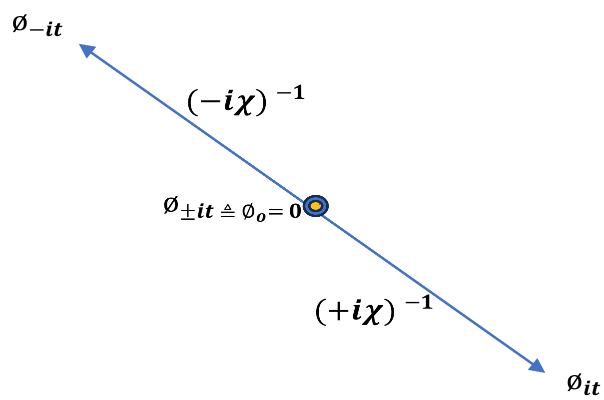


Figure 8. Emergence of bidirectional timelines $(\pm it)^{-1}$ from time singularity $(\emptyset_{\pm it=0})$ 'enabling' the existence of entity $(\pm\, i\chi)^{-1}$ +

+ 'enabling' as in *defining entity* $(\pm\, i\chi)^{-1}$*'s existence in time* $(\pm it)^{-1}$ (as being visually equivalent to 'occurring *on* timeline $\pm it$').

$$\boldsymbol{\emptyset_0} \xrightarrow{\overrightarrow{P_p}(i\chi)} \boldsymbol{\emptyset_{it}}$$

Figure 9. Performance of entity $(\pm\, \boldsymbol{i\chi})^{\,-1}$ on timeline ($\boldsymbol{\emptyset_0} \rightarrow \boldsymbol{\emptyset_{it}}$)

Here, the performance of the entity $\boldsymbol{i}\chi$ is depicted as

$$\overrightarrow{P_p}(\boldsymbol{i}\chi) = \vec{\mu}\,.\vec{\eta} \tag{20}$$

and the *sequencing* of the utility μ and productivity η functions represent the *causality* relationship between utility and productivity and the forward arrows → above μ and η reflect the *directionality of timeline* (termed $directive\ by\ author$) $\emptyset_0 \rightarrow \emptyset_{it}$.

Next, because utility and productivity functions are obviously functions of time $(\pm it)$, and recalling Equation (3):

$$(\eta)^{-\mathbf{1}} \triangleq \mu \ = \frac{\boldsymbol{i}}{\boldsymbol{o}} \tag{3}$$

Equation (20), $\overrightarrow{P_p}(i\chi) = \vec{\mu}\,.\vec{\eta}$ can now be rewritten as follows:

$$\overrightarrow{P_p}(\boldsymbol{i}\chi)=\vec{\mu}\,(\mathrm{it}).\vec{\eta}\,(\mathrm{it}) = \left(\frac{\mathbf{1}}{\vec{\eta}\,(\boldsymbol{it})}\right).\left(\frac{\mathbf{1}}{\vec{\mu}\,(\boldsymbol{it})}\right) = [\,\vec{\eta}(\boldsymbol{it}).\vec{\mu}\,(\boldsymbol{it})]^{-\mathbf{1}}$$

and, because any function of $(\pm \mathrm{it})^{-1} is\ a\ function\ of\ (\mp it)$

$$\overrightarrow{P_p}(i\chi)=\vec{\mu}\,(it).\vec{\eta}\,(it) = [\vec{\eta}(-it).\vec{\mu}\,(-it)]^{\,-1} \ = \ [\overleftarrow{\eta}\ .\ \overleftarrow{\mu}]^{-1} = \overleftarrow{P_P}(-i\chi).$$

That is, the performance measurement in the direction of $-it$ is as illustrated in Figure 10:

$$\varnothing_{-it} \xleftarrow{\quad\overleftarrow{P_p}(-i\chi)\quad} \varnothing_{0}$$

Figure 10. Performance of entity $-i\chi$ on timeline ($\varnothing_{-it} \longleftarrow \varnothing_{0}$)

This is now expressed as

$$-\overleftarrow{\eta}\,.\,\overleftarrow{\boldsymbol{\mu}} = \overleftarrow{P_p}(-i\chi) \tag{21}$$

Again, the *sequencing* of the utility μ function being precedent to the productivity η function represents the *causality* relationship between utility and productivity. The (now) backward arrows ← (above μ and η) indicate the particular *directionality of the timeline directive* $\varnothing_{-it} \longleftarrow \varnothing_{0}$ and hence, the *local time* circumstance in which the performance measurement is to be made.

Dirac pair

$i\chi$ and $-i\chi$ are now understood to be two (equivalent but) opposite (conventionally) charged (vector) 'states' *of the one entity* $(\pm\, i\chi)^{-1}$ in time $(\pm it)^{-1}$ (and, can and will be, referred to as a 'Dirac pair' in the remainder of this article[6]).

Therefore, the following statement is now claimed to be true of any time-based entity $(\pm it)^{-1}$ in a time-singularity-based universe.

(Preliminary) Conclusion #3

The performance of entity $(+\mathrm{i}\chi)^{-1}$on timeline $\varnothing_{0} \longrightarrow \varnothing_{it}$ is the *exact same* as that of its Dirac pair $(-i\chi)^{-1}$on timeline $\varnothing_{-it} \longleftarrow \varnothing_{0}$. That is,

$$\overrightarrow{P_p}(\boldsymbol{i}\chi) = \overleftarrow{P_p}(-i\chi) \tag{22}$$

Time field directives and quanta

Entity $(i\chi)^{-1}$as previously shown on the timeline $\boldsymbol{\emptyset_0} \longrightarrow \boldsymbol{\emptyset_{it}}$ of Figure 8 **(**and, of course, its 'Dirac twin' $(-i\chi)^{-1}$on the *same* timeline $\boldsymbol{\emptyset_{-it}} \longleftarrow \boldsymbol{\emptyset_0}$**)** can now be described more fully by the use of a *time frame* of form $(Alpha \propto Beta\ \beta\ Gamma\ \gamma)$ where α, β, γ are simple scalar quantities (registered by, for example, an 'Einstein clock') and applied to the depth, width and height 'directives' of entity $(\pm\, i\chi)^{-1}$.

Figure 11 shows the proposed time-frame set-up of entity $(i\chi)^{-1}$on timeline $\emptyset_0 \longrightarrow \emptyset_{it}$. In particular, α, β, γ are now formally defined as

$$\left\{\begin{array}{l} \propto\ \triangleq \underline{\text{quantum}} \text{ of directive } \textbf{depth} \text{ (i.e. } \underline{\text{number}} \text{ of cycles per second of depth)} \\ \beta\ \triangleq \underline{\text{quantum}} \text{ of directive } \textbf{width} \text{ (i.e. } \underline{\text{number}} \text{ of cycles per second of width} \\ \gamma\ \triangleq \underline{\text{quantum}} \text{ of directive } \textbf{height} \text{ (i.e. } \underline{\text{number}} \text{ of cycles per second of height)} \end{array}\right\} \quad (23)$$

Hence, in combination with the dimensionless unit directives $(\pm i, \pm j, \pm k)$, the $(\propto \beta\ \gamma)$ quanta measurements are identified as

$$\left\{\begin{array}{l} \propto\ = \text{time-depth of } (\pm\boldsymbol{i}\chi)^{-1} \text{ measured in } (\pm\alpha i t) \text{ seconds,} \\ \beta = \text{time-width of } (\pm\boldsymbol{i}\chi)^{-1} \text{ measured in } (\pm\beta j t) \text{ seconds and,} \\ \gamma = \text{time-height of } (\pm\boldsymbol{i}\chi)^{-1} \text{ measured in } (\pm\gamma k t) \text{ seconds} \end{array}\right\} \quad (24)$$

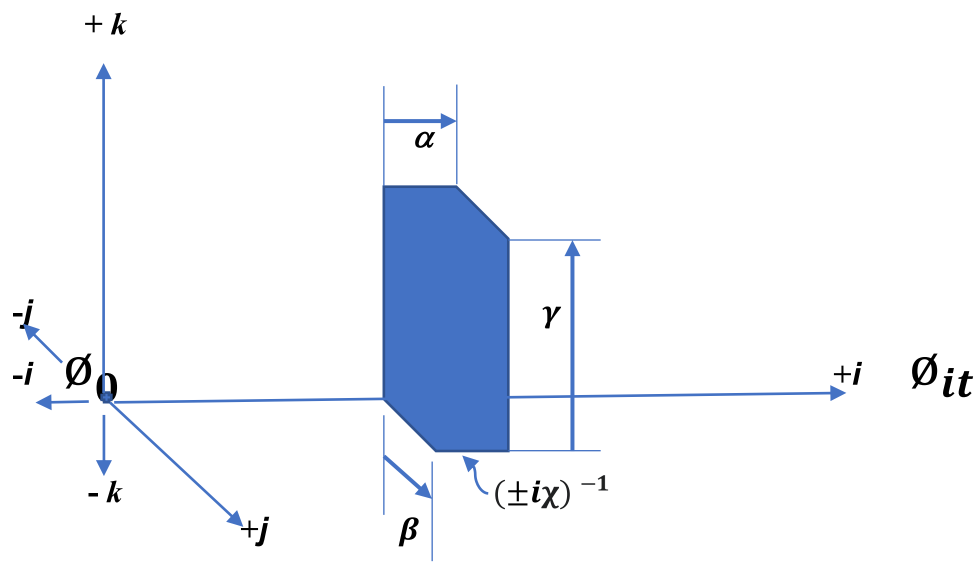


Figure 11. Time frame of entity $(\pm i\chi)^{-1}$on timeline $(\emptyset_0 \longrightarrow \emptyset_{it})$

Here, the universal measure of time $\pm it$ is defined to be

$$\text{Universal measure of time} \triangleq [(\pm it)^{-1}] = \text{‘seconds’} \tag{25}$$

Thus, parameters α, β, γ are simply the clock counts (quanta) associated with the time field description of the depth directive of $(\pm i\chi)^{-1}$, the width directive of $(\pm i\chi)^{-1}$ and the height directive of $(\pm i\chi)^{-1}$, respectively.

Last, if the time-frame description of $(\pm i\chi)^{-1}$is expressed as *$(\alpha\ \beta\ \Upsilon)$,* then that of its Dirac twin must be *$(-\alpha\ -\beta\ -\Upsilon)$,* simply because, again, ***$(\alpha\ \beta\ \Upsilon)$*** *are* $\pm it$ based entities (termed ‘directives’) such that, as per Equation (19):

$$\begin{bmatrix} i\chi = (-i\chi)^{-1} \\ -i\chi = (i\chi)^{-1} \end{bmatrix} - \tag{19}$$

giving, and meaning

$$\begin{bmatrix} (\alpha\,\beta\,\Upsilon) = (-\alpha - \beta - \Upsilon)^{-1} \\ - \\ (-\alpha - \beta - \Upsilon) = (\alpha\,\beta\,\Upsilon)^{-1} \end{bmatrix} \tag{26}$$

(Preliminary) Conclusion #4

Equation (26) is the *effective embodiment of all preliminary conclusion statements made thus far.* Therefore, it is noted that when treating nature as a time-based productive system, *any experiment* with such a system should at all times and in all circumstances clearly demonstrate the validity of Equation (26), as explained next.

D: Experimental evidence of the singular nature of time (causality experiments involving #1 [mirror inversion], #2 [film inversion] and #3 [positron annihilation])

To test the claim that Equation 26 must be true in all circumstances—that is, that all entities are of the singular nature of time and, therefore, $i\chi(\alpha\,\beta\,\Upsilon\,)\ and\ -i\chi(-\alpha\,-\beta\,-\Upsilon)$ should always co-exist in time—the following simple experiment is proposed.

Using the set-up of Figure 11 (as a guide), let an entity $(\pm i\chi)^{-1}$ exist in time on timeline $(\o_0 \longrightarrow \o_{it})$ so that it has all positive attributes of $(\alpha\,\beta\,\Upsilon)$ seconds. In the experiment that follows, this entity is to become the *self-observer* of the *effects* of its own causal actions (*causes*), all of which are within a singular (i.e. one off only) inertial frame of reference. That is, this experiment is to be *fully self-contained* as it only involves a *single observer observing only the effects of self-actions (self-causes)*$^{+}$.

Further, the same single observer-entity can also be given *substance* by declaring its *physical* attributes to be $(\alpha\,\beta\,\Upsilon)$, which are (therefore) to be measured in units of the *metre.* This is easily done by recognising that $(\alpha\,\beta\,\Upsilon)$ in metres is simply *$(\alpha\,\beta\,\Upsilon)$ in seconds <u>times</u> 'c' (speed of light as measured in the <u>same inertial reference field</u> in which $\alpha\,\beta$ and Υ are defined and measured).*

That is, $(\alpha\,\beta\,\Upsilon)$ in metres = $(\alpha\,\beta\,\Upsilon)$ [in ~~seconds~~] x c [in $\frac{\textbf{metres}}{\cancel{\textbf{second}}}$]. This means that $(\alpha\,\beta\,\Upsilon)$ are now measures of $i\chi$'s depth, width and height in metres where subsequently,

$$\left\{\begin{array}{l} \propto = \textbf{spatial-depth} \text{ of } \pm \boldsymbol{i}\chi \text{ measured in } (\pm\alpha \boldsymbol{ict}) \textbf{ metre}, \\ \beta = \textbf{spatial-width} \text{ of } \pm \boldsymbol{i}\chi \text{ measured in } (\pm\beta \boldsymbol{jct}) \textbf{ metre} \text{ and,} \\ \gamma = \textbf{spatial-height} \text{ of } \pm \boldsymbol{i}\chi \text{ measured in } (\pm\gamma \boldsymbol{kct}) \textbf{ metre.} \end{array}\right\} \quad (27)$$

Thus, quanta *α, β and Υ are all still simple, dimensionless numbers (counts)* registered on the Einstein clock, but the amount of time recorded is now the amount of time *light* takes to respectively traverse $i\chi$'s depth (α), width (β) and height (Υ) spatial dimensions.+

Causal Experiment #1 (mirror inversion)

Figure 12 shows the object $(\pm i\chi)^{-1}$ of interest (now designated as 'm') located on a single timeline along with a simple plane mirror. Object *m* is shown to be a three-dimensional entity with attributes of depth (α), width (β) and height (Υ). The state description of *m* is defined to be ($\alpha\,\beta\,\Upsilon$). Hence, *m* situated in front of the mirror will cause an image m_1' to be produced in the same mirror.

Note: Figure 12 represents a very simple, fully self-contained 'cause' (*m*) – 'effect' (m_1') productive system, in which the validity of Equation (26) can now be fully tested:

$$\begin{bmatrix} (\alpha\,\beta\,\Upsilon) = (-\alpha\,-\beta\,-\,\Upsilon\,)^{-1} \\ (-\alpha\,-\beta\,-\,\Upsilon\,) = (\alpha\,\beta\,\Upsilon\,)^{-1} \end{bmatrix} \qquad (26)$$

Details of the 'mirror' experiment are as follows:-

+ That is, no Einsteinian-type 'special' relativity effects play any part in the design/execution and, hence, the reporting of results claimed for this experiment. Also, it is noted that spatial *dimensionality emerges out of time* as per Equation (27).

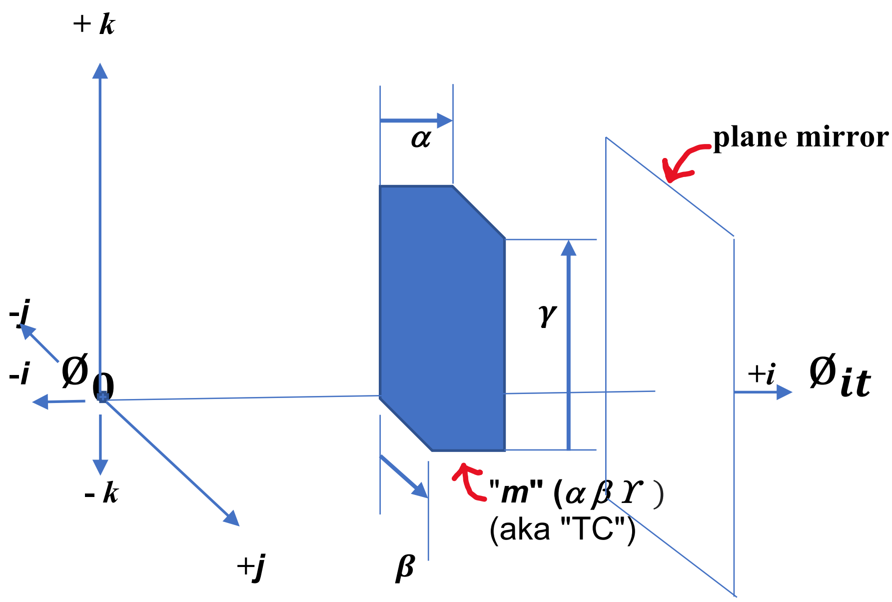


Figure 12. Time/Spatial frame of entity $i\chi$ ('m') on timeline $(\emptyset_0 \longrightarrow \emptyset_{it})$

The Mirror Experiment: To make the situation more relatable to an actual real-life experience, the experiment will be carried out with the help of an 'assistant' (called 'The Captain' or more simply 'TC'), who is to act as the real entity '$i\chi$', and is described as m (α β Υ) in the course of this experiment.

Next, many Exhibits are presented, which capture the key moments during this experiment. The Exhibits are presented in the same time-order as the events that unfolded in the execution of the experiment and represent a presentation style that facilitates its replication by any reader of this article who may want to personally conduct this experiment in part or in full to verify any or all of the reported results.

(As for the equipment required, all that is needed to conduct the experiment are two simple rectangular or square planar mirrors and some sticky tape to facilitate the edge-joining of the two mirrors, as demonstrated later in the experiment. An 'equivalent TC' should be used to position in front of the mirrors and be similarly 'marked-up'/labelled and used as shown in the following Exhibits).

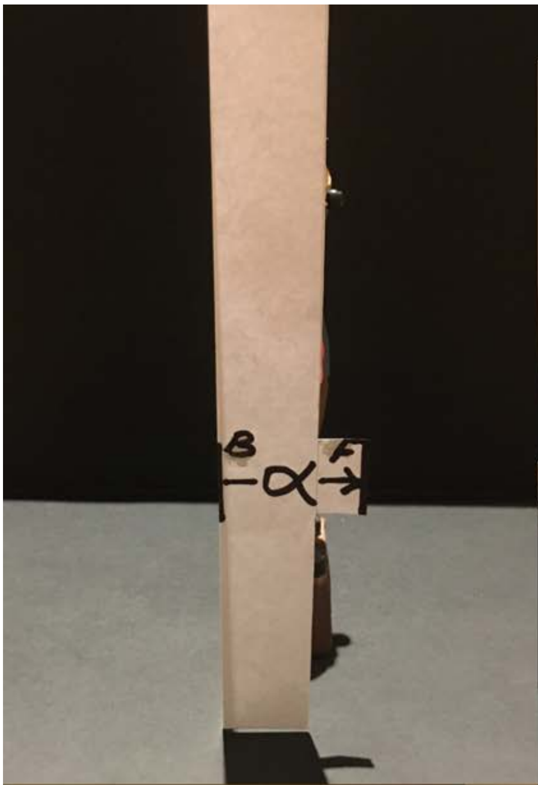
Exhibit A1 shows the defined measure of depth (α) of TC ($i\chi$) and is designated *m*(∝).

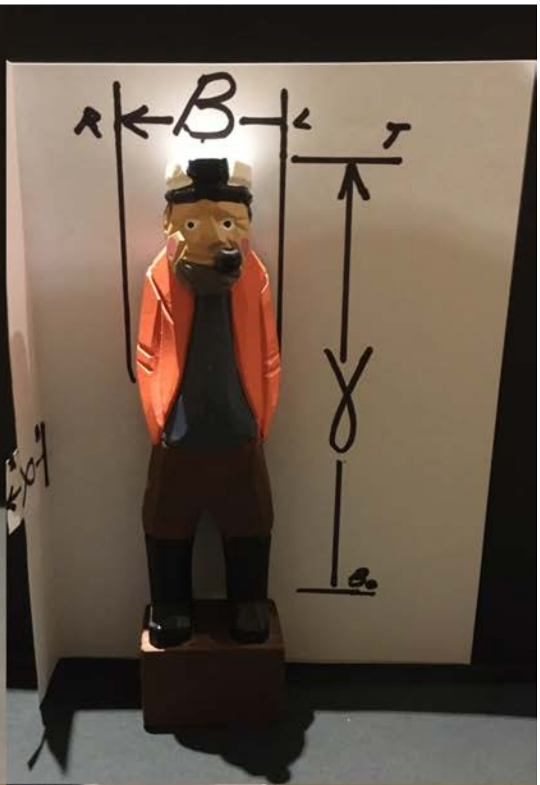
Exhibit B1 shows the corresponding measures of width (β) and height (Υ) of TC and are collectively designated *m*(β γ).

Exhibit C1 shows two views of the primary image m_1' as formed and reflected in the mirror. One can see (*in* the image) that both α and β have been *reversed*, whereas Υ has remained upright and has *not* been reversed. Sensibly, we can describe image m_1' as a primary image of *m* and give it the description $m_1'(-\alpha\ -\beta\ \ \Upsilon\ )$. The prime $'$ is used to remind us and all that we are dealing with an 'image'.

Exhibit A1: $\boldsymbol{m}\ (\propto)$

Exhibit B1: $\boldsymbol{m}\ (\ \boldsymbol{\beta}\ \boldsymbol{\gamma})$





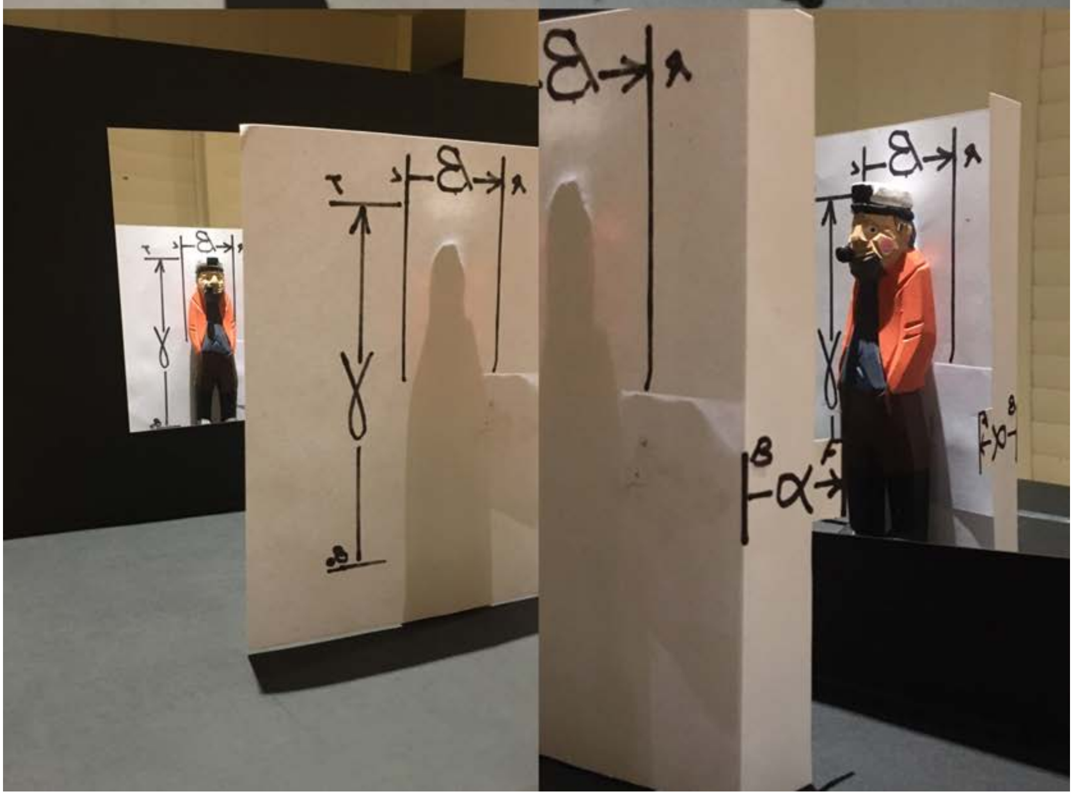
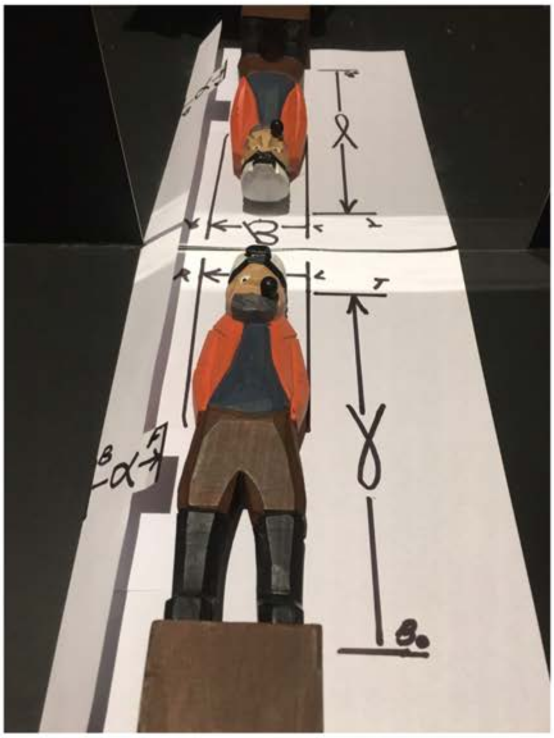


Exhibit C1: (two views of) $\boldsymbol{m'_1}$ (-$\propto$ -$\boldsymbol{\beta}$ $\boldsymbol{\gamma}$)

<u>Exhibit D1</u>: $\boldsymbol{m_2'}$ ($\propto$ -$\boldsymbol{\beta}$ $\boldsymbol{\gamma}$)



<u>Exhibit E1</u>: $\boldsymbol{m_3'}$ ($\propto$ -$\boldsymbol{\beta}$ -$\boldsymbol{\gamma}$)

Exhibit D1 shows 'TC' now standing aside the mirror. Again, from the image it can be observed that only β has been reversed and not α and not Υ. This *secondary* virtual image is designated $m_2'(\alpha - \beta\ \Upsilon)$.

Exhibit E1 is the third of the three possible images that can be formed by *m* being in front of a single mirror*. Here, the *tertiary* image $m_3'(\alpha - \beta\ - \Upsilon)$ is formed. That is, the virtual image shows that *both* β and Υ have been reversed.

Summary of results obtained thus far: States table (Table 1)

An informative way of considering (and, simultaneously, summarising) progressive results is to use a 'states' table. Table 1 is such a table. It shows the status of eight states, labelled State 0, 1, 2, 3 … 7.

The states are used to describe each object and image state, *and* since we are using three (3) parameters α, β and Υ and *each i*ndividual parameter can be reversed (i.e. have one of two directions, $\pm$), the greatest possible number of combinational states will be $2^3 = 8$ states.

The initial state '0' is assigned to the physical entity TC (*m*) along with the understood (signed $\pm$) status of each of TC's quanta, recorded as $+1$ or -1 in the appropriate α, β, Υ columns as follows: +1 for no reversal, and -1 for reversal.

Table 1. Progressive states: Causal Experiment #1 (mirror inversion)

State	Description	Υ	β	α	Description	State
0	*m*	+1	+1	+1		0
1	(X)	1	1	−1		1
2	m_2'	1	−1	1		2
3	m_1'	1	−1	−1		3
4	(X)	−1	1	1		4
5	(X)	−1	1	−1		5
6	m_3'	−1	−1	1		6
7		−1	−1	−1	$\overline{m}$	7

* since Figure 12 declares the wavefront propagation space to be three- dimensional.

Therefore, the first of the generated image states, primary image $m_1'(-\alpha\ -\beta\ \ \Upsilon)$, is shown in Table 1 as State 3:

1	-1	-1

The second of the generated images, secondary image $m_2'(\alpha\ -\beta\ \ \Upsilon)$, is shown as State 2:

1	-1	1

The third tertiary image $m_3'(\alpha\ -\beta\ -\Upsilon)$ is shown to be State 6:

-1	-1	1

Question:

What are the (unfilled) other states in Table 1 and how can they be generated?

Answer:

First, it is noted that the remaining unfilled states as seen under the header highlighted as:

Description
m

are States 1, 4 and 5 marked with an (X). These states number three in all—the exact *same number of states* we have so far found, which all happen to be ***β-directive reversed states.***

[Note: State 7 is not considered 'empty' at this stage as it is expected to be occupied by an 'equivalent' entity of form $\overline{m}$; see 'Special Note on State 7' later in this article for a fuller explanation].

Hence, we are immediately seeking to identify the three remaining unspecified states 1, 4 and 5 (X) that *should all have a positive (i.e. non-reversed) β in their description.*

Question:

Why do all the remaining unspecified states 1, 4 and 5 need to have a specified, non-reversed β in their description?

Answer:

This '+β' specification is a direct consequence of the fact that Table 1 is also a table of vector quantities.

Note: Entities α, β, Υ [each initially defined as per Equation (23)] are, in fact, entities with a *magnitude* (i.e. quantum) of value α *or* β *or* Υ but also (now) have a signed *direction* or 'character' designated as ' +' or '–'. Hence, technically, entities α, β, Υ are simply the measured magnitudes only (i.e. quanta) of *vector* state quantities to be further referred to later in this article as 'directors/directives'. However, before beginning the search for the 'missing' three +β-signed directive images, there might be the following query.

Question:

What causes the width-directive β to be reversed in the first place?

Answer:

Images in mirrors are formed by ambient light scattering off an object (TC, in our case) and propagating as an effective two-dimensional (2D) plane wave towards the reflecting mirror. This plane wave strikes the mirror at an angle of incidence and is reflected back at the same angle for an image to be formed and seen.

For a single plane mirror, Figure 13 shows a simple schematic of the plane wave striking the mirror at 90^0 and then being reflected back at the same angle (90^0), for a total 180^0 turn around of β (i.e. the $\boldsymbol{\beta}$ of the incident plane wave is reflected back as $\boldsymbol{-\beta}$ in the reflected plane wave). It is this reflected plane wave that has been captured by the camera as shown in the *β-directive reversed* Exhibits C1, D1 and E1.

Hence, in order to generate virtual images that *do not have β-reversal*, we need to effectively introduce an additional 180^0 phase shift (in the *β-directive* of the incident travelling wave) to ensure the 'turn around' angle effectively becomes 180^0+180^0= $360^0 \equiv 0^0$ or equivalently *no* reversal at all (which is exactly what we wish to achieve if β is *not to be reversed*).

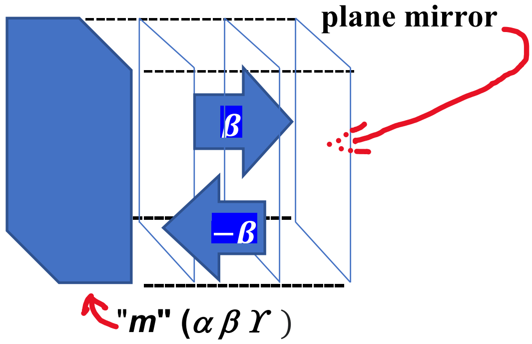


Figure 13. Simple refection of plane wave off single plane mirror (i.e. 180^0 turnaround of incident β to $-\beta$)

Therefore, an equivalent-extra 'single-mirror' reflection is called for, but we will have to introduce it in such a way that our non-reversing β-plan will work. The solution?

The Solution

First, it is noted that the β-*directive* of *m* is reversed in all of the image states of *m* generated thus far, $m_1'(-\alpha\ \text{-}\beta\ \ \Upsilon\ )$, $m_2'(\alpha\ \ -\beta\ \ \Upsilon\ )$ and $m_3'(\alpha\ \ -\beta\ \ -\ \Upsilon\ )$, and is being highlighted as -1 in Table 1. The solution to generating images with the β-*directive NOT reversed* is to extend the propagation path of the initial travelling wave and then introduce an additional required $180\ ^0$ phase shift to this travelling wavefront. This can be done by causing the incident 2D wavefront to move *orthogonally** to its normal forward direction of propagation and be returned in a *two-step procedure*, as shown in Figure 14.

* This effectively allows in-line (i.e. 'line-of-sight') information within the 'Lorentz' 2D travelling wavefront to be preserved.

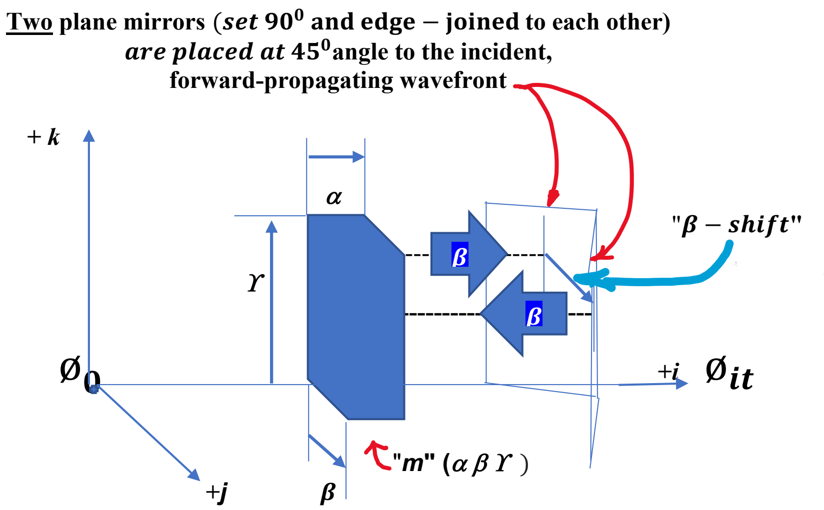


Figure 14. Generation of a '*Beta* (β) − *shift*'

The arrangement in Figure 14 is seen to introduce an extension to the forward propagation path of the initial travelling wavefront by *diverting the wave front by an extra* 90^0 *reflection* followed by a *second* 90^0 *reflection* that returns the propagating wave front with the required non-reversed β. Hence, in this study, this technique is called '*β**eta-shifting*'.

The circumstance shown in Figure 14 can be more clearly seen by reference to Exhibit F1. Exhibit F1 shows TC standing directly in front of and facing the two single planar mirrors that have now been joined vertically (edgewise) and angled 90^0 to each other. These mirrors, in turn, are angled at 45^0 to the incident travelling wavefront. The image is seen by looking at the intersection between the two mirrors. This 'split-mirror' image is a *true image* of TC. The image is claimed to be a true image because the β directive has remained true to that of $m(\alpha\,\beta\,\Upsilon)$.

Hence, the descriptor given to such an image is $m'_{1T}(-\alpha\;\;\beta_T\;\;\Upsilon)$. The prime $'$ indicates that this is again an image, and the subscript 1T indicates that the image is a primary (1) and a (T)rue image. The set of directives ($-\alpha\;\;\beta_T\;\;\Upsilon$) also reinforces the fact that the image is

True by the β descriptor now being designated as β_{T} (note that the nomenclature for describing images is now complete).

***Alpha*($\boldsymbol{\alpha}$), *Beta*($\boldsymbol{\beta}$) and *Gamma*($\boldsymbol{\Upsilon}$)** - shifts:

Just as Exhibit F1 demonstrates the generation of a $Beta(\beta)$ - *shifted,* primary true image $m'_{1\mathrm{T}}$(-α β_{T} Υ), Exhibits G1 and H1 demonstrate the corresponding generation of an $Alpha(\alpha)$ - *shifted* secondary true image $m'_{2\mathrm{T}}$(-α β_{T} Υ) of m and the $Gamma(\Upsilon)$ - *shifted* tertiary true image $m'_{3\mathrm{T}}(\alpha\ \beta_{\mathrm{T}} - \Upsilon)$ of the same m. These results are now entered into the states table as follows:

Table 2. Update of progressive states: Causal Experiment #1 (mirror inversion)

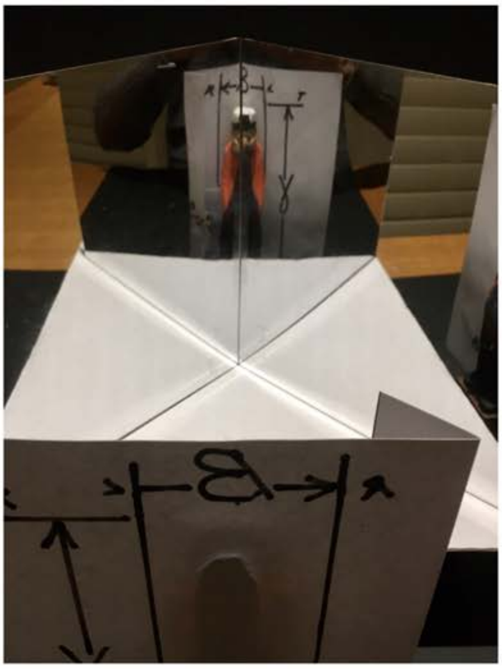
State	Description	Υ	β	α	Description	State
0	$m(\alpha\,\beta\,\Upsilon)$	1	1	1		0
1	$m'_{1\mathrm{T}}$(-α β_{T} Υ) $m'_{2\mathrm{T}}$(-α β_{T} Υ)	1	1	−1		1
2	$m'_2(\alpha - \beta\,\Upsilon)$	1	−1	1		2
3	$m'_1(-\alpha - \beta\,\Upsilon)$	1	−1	−1		3
4	$m'_{3\mathrm{T}}(\alpha\ \beta_{\mathrm{T}}$ -$\Upsilon)$	−1	1	1		4
5	-????????????-	−1	1	−1		5
6	$m'_3(\alpha - \beta - \Upsilon)$	−1	−1	1		6
7		−1	−1	−1		7

Table 2 shows that States 1 and 4 now have true images assigned to them as follows:

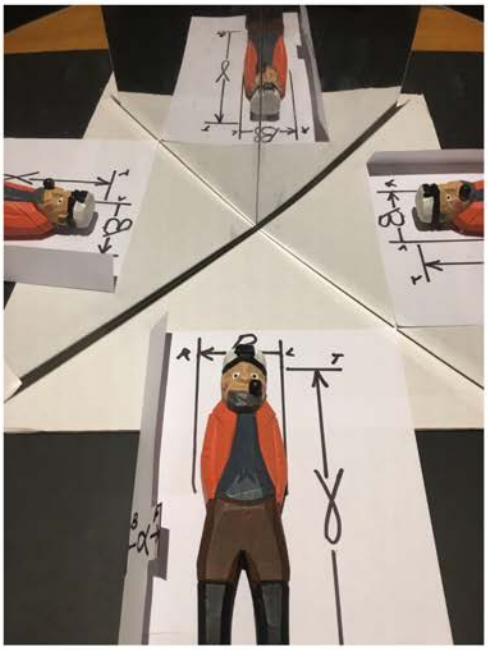
True images $m'_{1\mathrm{T}}$(-α β_{T} Υ) and $m'_{2\mathrm{T}}$(-α β_{T} Υ) are both assigned to State 1.

True image $m'_{3\mathrm{T}}(\alpha\ \beta_{\mathrm{T}}$ -$\Upsilon)$ is assigned to State 4. Further, ???...??? denotes that no image has yet been generated that corresponds to State 5.

<u>Exhibit F1</u>: $\boldsymbol{m'_{1T}}$ ($-\propto \boldsymbol{\beta_T}\ \boldsymbol{\gamma}$)



<u>Exhibit G1</u>: $\boldsymbol{m'_{2T}}$ ($-\propto \boldsymbol{\beta_T}\ \boldsymbol{\gamma}$)



<u>Exhibit H1</u>: $\boldsymbol{m'_{3T}}$ ($\propto \boldsymbol{\beta_T}\ -\boldsymbol{\gamma}$)

However, what *is* noticeable in Table 2 is that when we apply Equation (26),

$$\begin{bmatrix} (\alpha\,\beta\,\Upsilon) = (-\alpha-\beta-\Upsilon)^{-1} \\ (-\alpha-\beta-\Upsilon) = (\alpha\,\beta\,\Upsilon)^{-1} \end{bmatrix} \tag{26}$$

to the results already recorded thus far in Table 2, the following updated states table, Table 3, is revealed - which shows that when Equation (26) is applied to the left-hand side of the Table 2 results, a *complete complementary set of inverse images* is generated, which can be *causally ascribed* to an *equally productive entity of inverse form*: $i\chi = (i\chi)^{-1}$.

Table 3. Completed states: Causal Experiment #1 (mirror inversion)

State	Description	Υ	β	α	Description	State
0	$m(\alpha\ \beta\,\Upsilon)$	1	1	1		0
1	$m'_{1T}(\text{-}\alpha\ \beta_T\ \Upsilon)$ $m'_{2T}(\text{-}\alpha\ \beta_T\ \Upsilon)$	1	1	−1	$\bar{m}'_3(-\alpha\ \beta\ \Upsilon)$	1
2	$m'_2(\alpha-\beta\,\Upsilon)$	1	−1	1	$\bar{X}(\alpha-\beta\ \Upsilon)$	2
3	$m'_1(-\alpha-\beta\,\Upsilon)$	1	−1	−1	$\bar{m}'_{3T}(\alpha\ \beta_T\ \text{-}\Upsilon)$	3
4	$m'_{3T}(\alpha\ \beta_T\ \text{-}\Upsilon)$	−1	1	1	$\bar{m}'_1(\alpha\ \beta-\Upsilon)$	4
5	$X(-\alpha\ \beta-\Upsilon)$	−1	1	−1	$\bar{m}'_2(-\alpha\ \beta-\Upsilon)$	5
6	$m'_3(\alpha-\beta-\Upsilon)$	−1	−1	1	$\bar{m}'_{2T}(\alpha\ \beta_T\ \text{-}\Upsilon)$ $\bar{m}'_{1T}(\alpha\ \beta_T\ \text{-}\Upsilon)$	6
7		−1	−1	−1	$\bar{m}(-\alpha\ -\beta-\Upsilon)$	7

That is, given that $i\chi$ was designated as '*m*' at the beginning of the mirror experiment, -$i\chi$ can now be designated $\bar{m}$ at the end of the mirror experiment as Table 3 shows. Therefore, this implies that not only can *m* (TC) generate primary, secondary, tertiary *and* a set of True images of itself, but also *m's Dirac twin* $\bar{m}$ (*in real time* and, simultaneously, theoretically residing on its own -*it* timeline), is performing in the *exact same way as m*—such as looking into a mirror, taking photos as ***his*** experiment progresses and progressively recording results in *his* Progressive States Table—all at the *same time as m*. *That is, both m and* $\bar{m}$ *are seen to perform identically and instantaneously at the same time through the agency of the inverse* **real time transfer function** *of the singularity of time* $\emptyset_{\pm it} = (\pm \boldsymbol{it})^{-1}$.

Hence, it is *only through the agency of the time singularity* that all octant states of Table 3 are now shown to be occupied by *m's* and $\overline{m}$*'s* virtual and true images—all, except for **State 5** and its complementary inverted **State 2**. These states remain empty thus far and are yet to be explained.

Hence, with respect to all identified *occupied* states in Table 3, there is an apparent real-time *complementarity of performance* between entities *m* and $\overline{m}$. However, it may be recalled that this is *precisely what was predicted earlier* [see Equation (10)] and is now re-stated in the performance theory format as Equation (22),

$$\overrightarrow{P_p}(\boldsymbol{i}\chi) = \overleftarrow{P_p}(-i\chi) \tag{22}$$

and hence, should *not* come as a surprise.

Last, a comment on the *unassigned* **State 5** and its *inverse,* **State 2**, is now in order. As Table 3 shows, no image of either *m* or $\overline{m}$ **(**virtual or true) was found to occupy any such state. However, it is noted that for '*m'* to 'travel' or be 'transformed' from State 0 into **State 5**, $\overline{m}$ *similarily and simultaneously needs to 'travel' or be 'transformed' from* **State 7** *to a* **State 2**. That is, both *m* and $\overline{m}$ would undergo similar transforms *but* both will also carry (cause) respective *unchanged* β and $-\beta$ directives (effects) to also be seen in these **5/2 States** (as indicated by the vertical arrows now superimposed on Table 3**)**. The significance of this ' β conservation' of *m* and the ' $-\beta$ conservation' of $\overline{m}$ is that both *m* and $\overline{m}$ retain their *True* (unchanged β , $-\beta$) identities**.** That is, both *m* and $\overline{m}$ will remain *conserved (True) entities* if and whenever they transition to State 5/2. (Note: The role of **States 5/2** in Table 3 will be further commented upon in detail in the section in which Experiment #3 is presented and discussed later in this article.)

Conservation of chirality in the True images of the mirror experiment

(Noether's theorem and Mobius action)

Last, it needs to be shown that the $\alpha\beta\gamma$-shifts used to generate true images of $m/\overline{m}$ in the mirror experiment also serve to conserve chirality in the time-singularity process of inversion. To demonstrate this, use is made of the marker as shown in Figure 15:

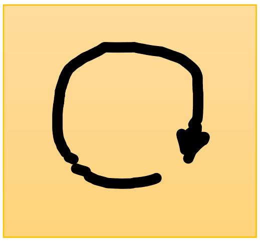


Figure 15. Clockwise chirality marker $\boldsymbol{\beta_{\circlearrowright}}$

This marker simulates TC performing a simple right-hand motion in the clockwise direction. This 'motion-marker' can then be traced throughout each step of a repeat process of the mirror experiment. Thus, as with the original set of Exhibits A1–H1, the repeat experiment with the chirality marker is shown as matching Exhibits A2–H2.

This chirality marker was attached to TC as shown in Exhibits A2 (TC facing) and B2 (TC turned away). The β symbol in the states table description of images is now changed to reflect the chirality involved in generating and reporting such images, that is, $\beta_{\circlearrowright}$ - $\beta_{\circlearrowleft}$ and $\beta_{T\circlearrowright}$ are used.

To start off this extension of the mirror experiment, the new 'chiral-description' of m in State 0 is now given as $m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon)$ as seen facing, as in Exhibit A2 and as $\overline{m}$(-∝ -$\beta_{\circlearrowleft}$ γ) as seen facing away, as in Exhibit B2.

Exhibit A2: $m(\propto \beta_{\circlearrowright}\, \gamma)$ **Exhibit B2**: $m(-\propto -\beta_{\circlearrowleft}\, \gamma)$

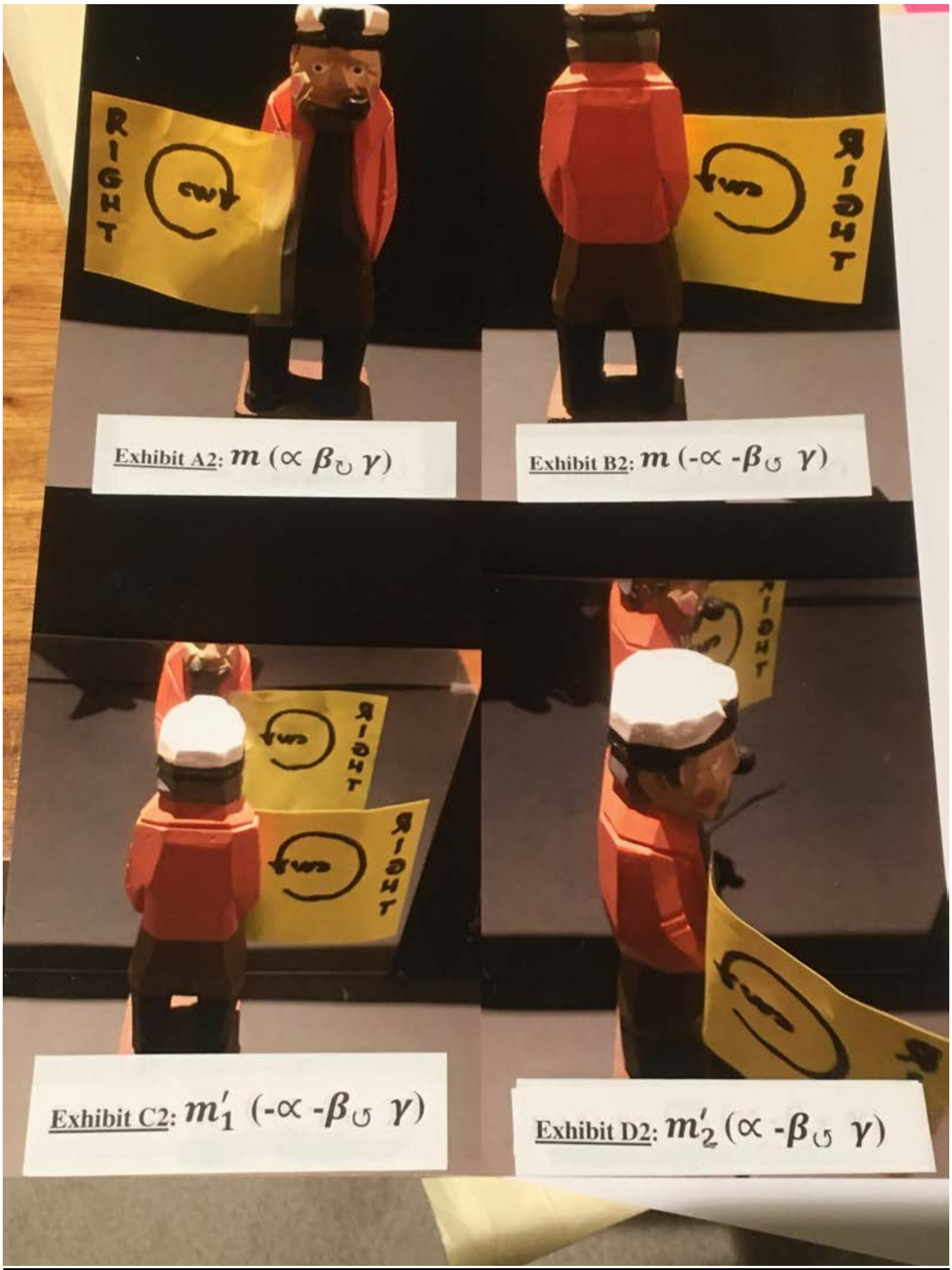


Exhibit C2: m_1' $(-\propto -\beta_{\circlearrowleft}\, \gamma)$ **Exhibit D2**: m_2' $(\propto -\beta_{\circlearrowleft}\, \gamma)$

Exhibit C2 shows TC again standing directly in front of a single plane mirror. The primary image m_1' reflected in the mirror can be seen to have *both the α and the $\beta_{\circlearrowright}$ quanta* *directives reversed*, whereas Υ has remained upright. Therefore, we can describe the image m_1' as the *primary* virtual image of *m*, given by the description $m_1'(-\alpha \ \ -\beta_{\circlearrowleft} \ \ \Upsilon)$.

Exhibit D2 shows TC now standing aside the mirror. Again, this image shows that only $\beta_{\circlearrowright}$ has been reversed, and not α and Υ. This *secondary* virtual image is designated $m_2'(\alpha \ -\beta_{\circlearrowleft} \Upsilon \ )$.

Exhibit E2 is the third of the three possible images that can be formed by *m* again being in front of a single mirror. Here, the *tertiary* image $m_3'(\alpha - \beta_{\circlearrowleft} - \Upsilon)$ is formed. That is, the virtual image shows that *both* β *and* Υ have been reversed.

Exhibit F2 shows TC standing directly in front of and facing the two single planar mirrors again joined vertically (edgewise) and angled 90^0 to each other. These mirrors, in turn, are again angled at 45^0 to the incident travelling wavefront. The image seen reflected in the resulting 'split mirror' is a *True* image of TC. The image is again claimed to be a True image because now the $\beta_{\circlearrowright}$ directive has remained true to that of $m(\alpha\,\beta_{\circlearrowright} \ \Upsilon)$. Thus, the descriptor given to the image is $m_{1\mathrm{T}}'\ (-\alpha \ \ \beta_{T\circlearrowright} \ \ \Upsilon)$. The prime $'$ indicates that this is again an image, and the subscript 1T indicates that the image is primary (1) and a (T)rue image. The set of directives (-$\alpha \ \ \beta_{T\circlearrowright} \ \ \Upsilon$) also reinforces the fact that the image is **T**rue by the $\beta_{\circlearrowright}$ descriptor now being designated $\beta_{T\circlearrowright}$.

Exhibits G2 and H2 demonstrate the corresponding generation of the *Alpha*(α) - *shifted* secondary True image $m_{2\mathrm{T}}'$(-$\alpha \ \ \beta_{T\circlearrowright} \ \ \Upsilon$) of m and the $Gamma(\Upsilon)$ - *shifted* tertiary True image $m_{3\mathrm{T}}'(\alpha \ \ \beta_{T\circlearrowright} - \Upsilon)$ of the same m. These results are tabulated in Table 4.

Table 4. States table of causal chirality (Experiment #1: mirror inversion)

State	Description	Υ	β	α	Description	State
0	$m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon)$	1	1	1		0
1	$m_{1\mathrm{T}}'$(-$\alpha \ \ \beta_{T\circlearrowright} \ \ \Upsilon$) $m_{2\mathrm{T}}'$(-$\alpha \ \ \beta_{T\circlearrowright} \ \ \Upsilon$)	1	1	−1		1
2	$m_2'(\alpha - \beta_{\circlearrowleft} \Upsilon)$	1	−1	1	$\bar{\mathrm{X}}(\alpha - \beta_{\circlearrowleft} \ \Upsilon)$	2

3	$m_1'(-\alpha - \beta_{\circlearrowleft} \Upsilon)$	1	−1	−1		3
4	$m_{3\mathrm{T}}'(\alpha\ \beta_{T\circlearrowright}\text{-}\Upsilon)$	−1	1	1		4
5	$\mathrm{X}(-\alpha\ \beta_{\circlearrowright} - \Upsilon)$	−1	1	−1		5
6	$m_3'(\alpha - \beta_{\circlearrowleft} - \Upsilon)$	−1	−1	1		6
7		−1	−1	−1		7

Again, when Equation (26) is applied to the left-hand side of the Table 4 results, a *complete complementary set of inverse images* is generated as shown in Table 5, which again are causally ascribed to an equally productive entity designated $\bar{\boldsymbol{m}}$ and of form $i\chi = (i\chi\ )^{-1}$.

<u>Exhibit E2</u>: m'_3 ($\propto$ -$\beta_{\circlearrowleft}$ -γ)

Exhibit F2: $m'_{1\mathrm{T}}$ (-$\propto$ $\beta_{T\circlearrowright}$ γ)

<u>Exhibit G2</u>: $m'_{2\mathrm{T}}$ (-$\propto$ $\beta_{T\circlearrowright}\gamma$)

<u>Exhibit H2</u>: $m'_{3\mathrm{T}}$ ($\propto$ $\beta_{T\circlearrowright}$-$\gamma$)

Table 5. States table of causal chirality (Experiment #1: mirror inversion)

State	Description	Υ	β	α	Description	State
0	$m(\alpha\ \beta_{\circlearrowright}\ \Upsilon)$	1	1	1		0
1	$m'_{1\mathrm{T}}(-\alpha\ \beta_{T\circlearrowright}\ \Upsilon)$ $m'_{2\mathrm{T}}(-\alpha\ \beta_{T\circlearrowright}\ \Upsilon)$	1	1	−1	$\overline{m}'_3(-\alpha\ \beta_{\circlearrowright}\ \Upsilon)$	1
2	$m'_2(\alpha-\beta_{\circlearrowleft}\Upsilon)$	1	−1	1	$\overline{\mathrm{X}}(\alpha-\beta_{\circlearrowleft}\ \Upsilon)$	2
3	$m'_1(-\alpha\ -\beta_{\circlearrowleft}\Upsilon)$	1	−1	−1	$\overline{m}'_{3\mathrm{T}}(-\alpha-\beta_{\mathrm{T}_{\circlearrowleft}}\ \Upsilon)$	3
4	$m'_{3\mathrm{T}}(\alpha\ \beta_{T\circlearrowright}-\Upsilon)$	−1	1	1	$\overline{m}'_1(\alpha\ \ \beta_{\circlearrowright}-\Upsilon)$	4
5	$\mathrm{X}(-\alpha\ \beta_{\circlearrowright}\ -\Upsilon)$	−1	1	−1	$\overline{m}'_2(-\alpha\ \beta_{\circlearrowright}-\Upsilon)$	5
6	$m'_3(\alpha-\beta_{\circlearrowleft}-\Upsilon)$	−1	−1	1	$\overline{m}'_{2\mathrm{T}}(\alpha-\beta_{\mathrm{T}_{\circlearrowleft}}\text{-}\Upsilon)$ $\overline{m}'_{1\mathrm{T}}(\alpha-\beta_{\mathrm{T}_{\circlearrowleft}}\text{-}\Upsilon)$	6
7		−1	−1	−1	$\overline{m}(-\alpha\ \ -\beta_{\circlearrowleft}-\Upsilon)$	7

Therefore, Table 5 shows that not only can *m* (TC) statically generate ($-\beta$) primary, secondary, tertiary *and* a (β_{T}) True image of itself, but also can *dynamically* generate ($-\beta_{\circlearrowleft}$) primary, secondary, tertiary *and* a ($\beta_{T\circlearrowright)}$True image of itself. Further, in both cases [i.e. (β) and ($\beta_{\circlearrowright)}$)], *m's Dirac twin* $\overline{\mathrm{m}}$ (*in real time* and *simultaneously residing on the **-it** timeline*) *is performing in the exact same way*, looking into a mirror, taking photos as *his* experiment progresses and progressively recording results in *his* equally dynamic (i.e. $-\beta_{\circlearrowleft}$) progressive states table.

(Preliminary) Conclusion #5

If the entity $\overline{\mathrm{TC}}$ [aka: $-i\chi,\ ,\overline{m}(-\alpha\ -\beta_{\circlearrowleft}-\Upsilon)$] does exist in nature, then the results of the mirror experiment show that its behaviour (performance) will always (in every way and circumstance) perfectly match that of *TC. This result can only come about if time itself is of a time singularity of form*: $\varnothing_{\pm it}$=$(\pm it\ \ )^{-1}$.

'Special Note on State 7' [i.e. proof of the reality of entity $\overline{\boldsymbol{m}}(-\alpha\ \ -\beta_{\mathrm{T}_{\circlearrowleft}}-\Upsilon)$ in State 7]

TC (m) is, of course, a real entity and is described by State 0 (in Table 5) as entity

$m(\alpha \quad \beta_{\circlearrowright} \quad \Upsilon)$. Now Exhibit I shows (as with the previous experiment's Exhibit B2) TC *facing away* from the viewer (into his forward-facing α-direction):

x ***α - direction axis (into page)***

Exhibit I: TC $m(\alpha \quad \beta_{\circlearrowright} \quad \Upsilon)$ facing away into his α-direction

TC can now be rotated forward 90^0 about his β-axis as shown in Exhibit J:

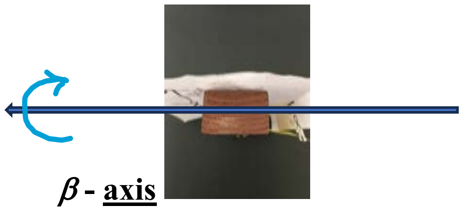


Exhibit J: TC rotated forward 90^0 about his β-axis

In addition, rotating TC *a further 90^0 about the β-axis* results in the complete inversion of TC, as shown in Exhibit K:

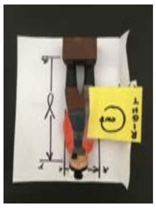


Exhibit K: TC completely (physically) inverted as $\bar{m}(-\alpha \quad -\beta_{\circlearrowleft} \quad -\Upsilon)$

That is, Exhibit K shows TC to have been completely (physically) inverted again from an entity $m(\alpha \quad \beta_{\circlearrowright} \quad \Upsilon)$ occupying State 0 in Table 5 into entity $\bar{m}(-\alpha \quad -\beta_{\circlearrowleft} \quad -\Upsilon)$ occupying State 7, where $(\beta_{\circlearrowright})^{-1}$ becomes $-\beta_{\circlearrowleft}$. Thus, entity $\bar{m}$ is as real a physical entity as is m.

[i.e. proof of the reality of entity $\overline{m}(-\alpha-\beta_{\circlearrowleft}\ \ \varUpsilon)$ is, therefore, now claimed in this study.]

Note 1: TC can be similarly equally rotated in the reverse -180^0 direction about TC's *β-axis, and the result will be the same.* In this article, these actions are called a "$\pm180^0$ half Noether turn" in that the *apparent equivalent rotational symmetry within the time singularity* simply maintains the angular momentum of the entity *m into* $\overline{m}$ (and as per Noether's theorem), and $\overline{m}$*'s angular momentum equivalently transforms back into that* $of\ \ m$ on, again, transformation through the time singularity.

Note 2: The same conservation of angular momentum result (through the now apparent equivalent symmetry property of the time singularity) also comes about by adopting a 'Mobius' type approach to rotations. That is, the singularity action $(\emptyset_{\pm it})^{-1} = (\pm it)^{-1}$ is not only equivalent to the 'Noether $\pm180^0$ half-turn' as above, but also is *equivalent to a Mobius-strip type action also in and about the point singularity itself.*

This is again demonstrated by starting with TC $m(\alpha\ \ \beta_{\circlearrowleft}\ \ \varUpsilon)$ facing away into his_α-direction as per Exhibit L:

x ***α* - direction axis (into page)**

Exhibit L: TC $m(\alpha\ \ \beta_{\circlearrowleft}\ \ \varUpsilon)$ facing away into his α-direction axis

TC can now be rotated a full $\pm180^0$ about the x α - **axis**; the result is illustrated in Exhibit M:

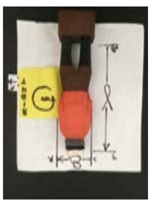
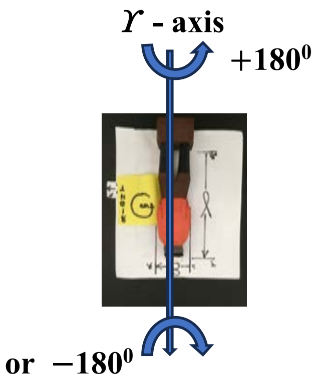


Exhibit M: Result of TC rotated $\pm180^0$ about the (inward pointing x) α - axis

When followed by a further $\pm 180^0$ rotation about the (vertically pointing) Υ - axis,



it results in, again, a complete (physical) inversion:

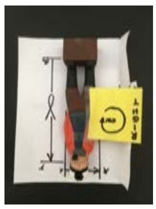


Exhibit N: TC again completely (physically) inverted as $\bar{m}(-\alpha\ \ -\beta_{\circlearrowleft}\ -\Upsilon)$

Thus, proof of reality of the entity $\bar{m}(-\alpha\ \ -\beta_{\circlearrowleft}\ -\Upsilon)$ is again evident through Exhibit N.

The result of the Mobius action shows the status of TC again being changed from the State 0 $m(\alpha\ \ \beta_{\circlearrowleft}\ \ \Upsilon)$ status into the fully inverted new status of State 7: $\bar{m}(-\alpha\ \ -\beta_{\circlearrowleft}\ -\Upsilon)$.

Thus, the *action of the time singularity* itself is similar in effect to the action of a *single action* $\pm 180^0$ Noether half-turn, about TC's *β-axis* or, a Mobius *double action* of $\pm 180^0$ about TC's $\alpha - axis$ followed by the $\pm 180^0$ rotation about TC's Υ*- axis*.

However, it is noted that the time singularity is a much *more energy-efficient* process as it *theoretically requires only a single quantum* (h) of energy to *invert m* into $\bar{m}$, whereas the *Noether and Mobius actions both require (one- and two-off, respectively) relatively more energy intense $\pm 180^0$ actions to* <u>*physically*</u> *rotate the m from State 0 into the $\bar{m}$ of State 7.*

(Preliminary) Conclusion #6

The transition of entity TC [aka: $i\chi$, $m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon)$] into entity $\overline{\text{TC}}$ [aka: $-i\chi$] $\bar{m}(-\alpha \ \ -\beta_{\circlearrowleft} - \Upsilon$ and vice versa is a *natural action of the singularity of time.* It is also the *most energy-efficient process* as it is inherent in the previously noted inversion and normalisation transfer functions of the time singularity itself.

Causal Experiment #2 (film inversion)

This second experiment is to investigate how well the time singularity preserves the information flow in both the $m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon)$ realm and the $\bar{m}(-\alpha \ \ -\beta_{\circlearrowleft} - \Upsilon)$ realm, for all of time. That is, if the time-singularity hypothesis is to be held to be true, then both the *information* and *information flow* within and between the $m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon)$ and the $\bar{m}(-\alpha \ \ -\beta_{\circlearrowleft} - \Upsilon)$ realms need to be shown to be conserved at all times.

The experiment consists of a simple (but powerful) light source (projector) illuminating the framed images of a film strip and projecting the same images onto a large viewing screen, as illustrated in Figure 16.

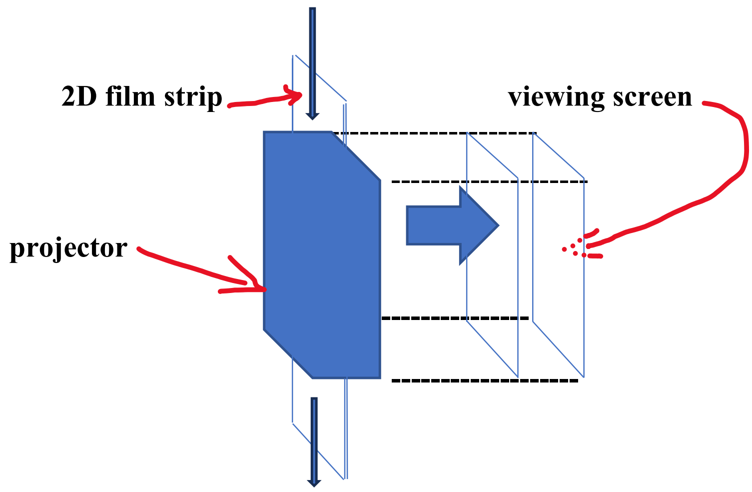


Figure 16. Simple projection of film strip images on to a viewing screen

Figure 16 shows the projector (the *productive system* in this experiment) fixed in space and positioned just below the film strip. The projector is to operate in real time $\boldsymbol{\emptyset_0}$ to Time (+*it*) and is deemed to have a productive transfer function ('projection') of η_n where η_n is the *projection* of the *nth frame of the film strip onto the viewing screen*.

In practice, this (pseudo 'thought') experiment does not need the projector, per se, but just a simple set of Mylar (plastic) frames to act as a short-length film strip. The film strip consists of just seven time frames and is prepared as shown in Exhibit A3. Each frame of the film is shown to be an individual piece of transparent Mylar measuring 3 cm height by 6 cm width and *each film frame can be handled independently of all others* (i.e. the 'film' has effectively been 'cut' into its individual frames).

Exhibit A3 shows an observer $m(\alpha\,\beta\,\Upsilon)$ witnessing the projection of each image onto the screen in the *technological order* of the projection/screening time events, as follows:

$$\boldsymbol{Technological\ order}: \boldsymbol{\eta_1\ \ \eta_2\ \ \eta_3\ \ \eta_4\ \ \eta_5\ \ \eta_6\ \ \eta_7}.$$

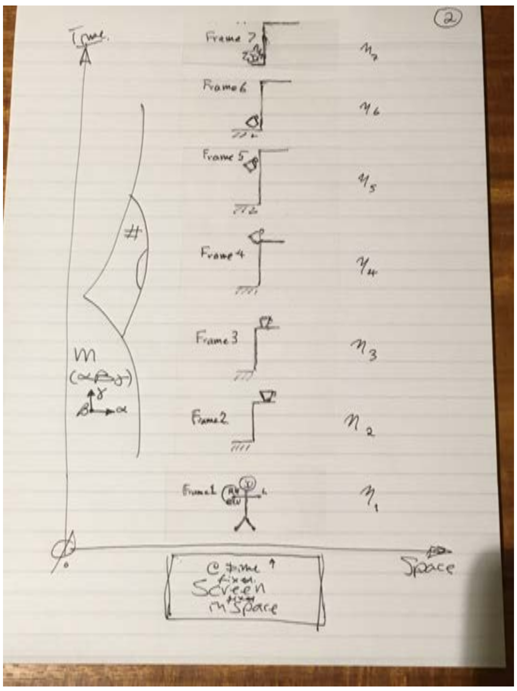


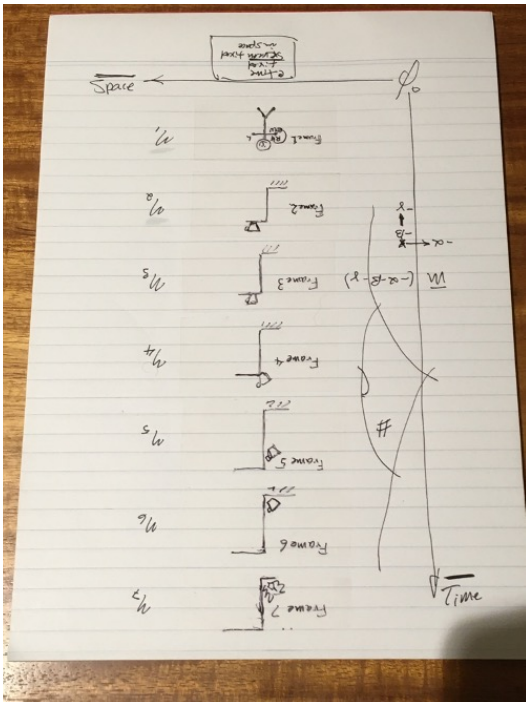
Exhibit A3: Film strip of seven frames projected in the technological sequence Frame 1 to 7, progressing (vertically upwards) in time from $\boldsymbol{\emptyset_0\ to\ Time\ +it}$

[i.e. observer $m(\alpha\,\beta\,\Upsilon)$ $sees$ the film strip with $\propto$, β and γ as normal]

Thus, the observer sees the progressive action of the film in which a cup moves to the left, topples over the edge of a table, falls and smashes into pieces on hitting the floor.

Now, the film is to be progressively 'inverted' as follows: Starting with Frame 1, flip it over horizontally. This has the effect of reversing the $\propto$-directive of the frame. Do likewise for each of the remaining frames but ensure that the technological sequence Frame 1 … 7 is strictly maintained.

Next, the β-directive of each frame is reversed, followed by the progressive reversal of the γ-directive. The result of the $\propto, \beta$ and γ-directive reversals is shown in Exhibit B3, which shows the situation in the reversed-time, reversed-space domain *of* $(-\alpha - \beta - \Upsilon)$. What we see when we examine Exhibit B3 is the bizarre situation of the cup rising from the floor, reassembling itself and falling 'upwards' relative to the edge of the table to finish landing up on the table. *This is obviously NOT what we saw in Exhibit A3!*



<u>Exhibit B3</u>: Film strip of same seven frames projected in the technological sequence Frame 1 to 7, progressing (vertically downwards) in time from $\emptyset_0$ *to* Time $-$ *it*

[i.e. observer $\overline{m}(-\alpha - \beta - \Upsilon)$ sees the film strip with $\propto$, β and γ *all* inverted]

However, for us to *understand* what the inverted observer $\overline{m}$ in the domain $(-\alpha - \beta - \Upsilon)$ sees, we have to either transform our $(\alpha\,\beta\,\Upsilon)$ domain eyes into $(-\alpha - \beta - \Upsilon)$ domain eyes, or vice versa, transform $(-\alpha - \beta - \Upsilon)$ domain eyes into $(\alpha\,\beta\,\Upsilon)$ domain eyes. Fortunately, we have already seen we can make the necessary transformation using either the double $\pm 180^0$ Mobius action or the single $\pm 180^0$ Noether half-turn action to make the necessary space-in-time transformation.

Electing to use the simpler Noether half-turn approach, we can rotate the $(-\alpha - \beta - \Upsilon)$ domain of Exhibit B3 through either a 180° clockwise or −180° anticlockwise (Noether) half rotation as shown progressively in Exhibit C3 and Exhibit D3

What we now see in Exhibit D3 is what the inverted observer $\overline{m}$ sees in Exhibit B3. On comparing Exhibit D3 with Exhibit E3 side by side, we now see that the *lived experience* of $\overline{m}(-\alpha - \beta - \Upsilon)$ in Exhibit D3 is now *exactly the same lived experience* of $m(\propto\ \beta\,\gamma)$ of Exhibit A3.

Thus, between domains $m(\propto\ \beta\,\gamma)$ and $\overline{m}(-\alpha - \beta - \Upsilon)$, *information content and information flows are conserved* through the time singularity $\varnothing_{\pm it} = (\pm it)^{-1}$

(Preliminary) Conclusion #7

The time singularity function $\varnothing_{\pm \boldsymbol{it}} = (\pm \boldsymbol{it})^{-1}$ allows for the immediate and accurate transfer of all real-time cause–effect (causal) and technological sequencing information between time domains (+*it*) and (-*it*) at all times (and in the *most energy-efficient* manner).

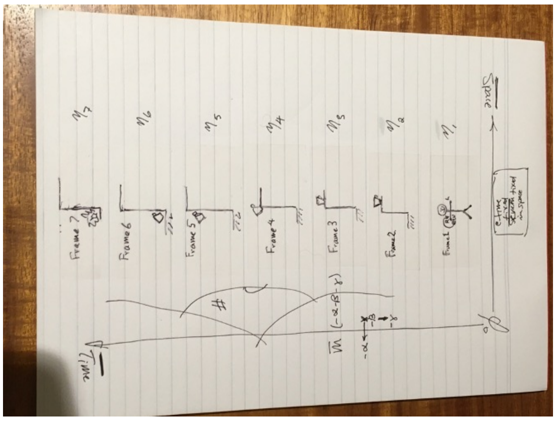
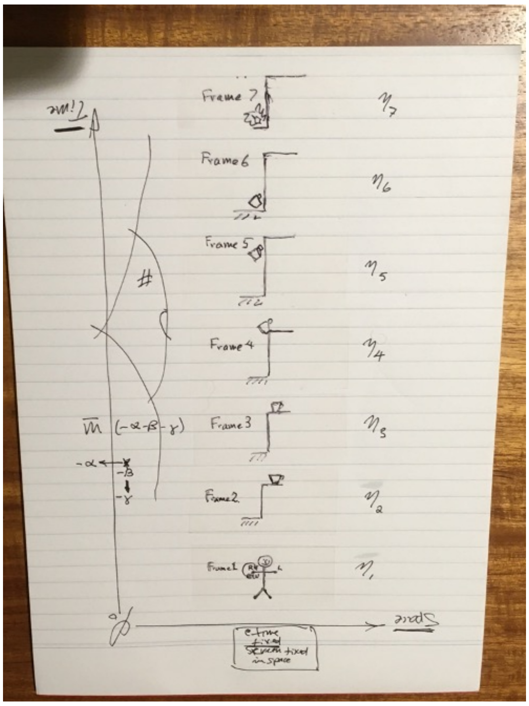


Exhibit C3: Exhibit B3 rotated 90^0 clockwise



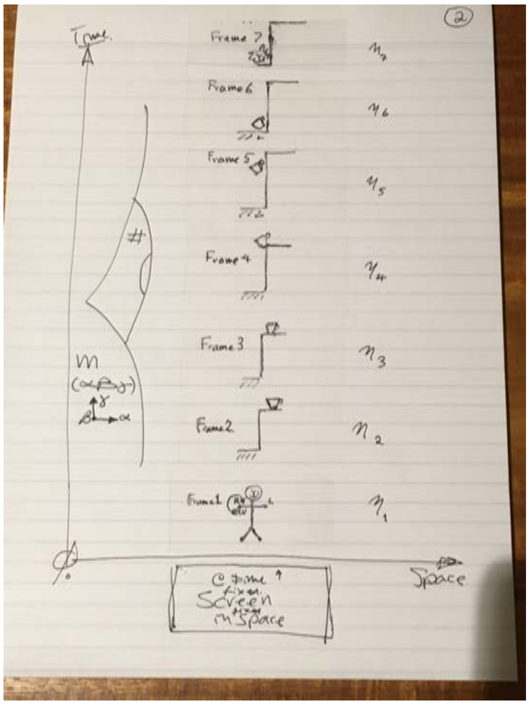


Exhibit D3: Exhibit C3 rotated a further 90^0 clockwise (What observer $\overline{m}$ sees)

Exhibit E3: Exhibit A3 (pg 49)

(What observer m saw)

Causal Experiment #3 (positron annihilation)

Our experimental 'mirror' and 'film' results (thus far) show that the states Table 5 has so far been able to offer an *almost* complete description of all possible (8) states a bidirectional *matter–antimatter* (using Dirac-type terminology) time entity of form $m = (\overline{m})^{-1}, \overline{m} = (m)^{-1}$ can occupy. This has been claimed on the basis that the timeline duality itself is due to the omnidirectionality nature of the singularity of time, that is, $(\pm it)^{-1} = (\mp it)^{-1}$, which, of course, dictates, therefore, that all universal entities of form $(\pm it)^{-1}$ that reside on such timelines subsequently must have the exact same duality of form. That is a form with the inversion property:

$$\begin{bmatrix} i\chi = (-i\chi)^{-1} \\ -i\chi = (i\chi)^{-1} \end{bmatrix} \tag{19}$$

Further, experimental results progressively posted to the states table have also shown both energy and information content conservation in both m and $\bar{m}$ transitioning between m 'ground State' 0 (and m virtual image States 3, 2, 6 and true image states 1, 4**)** *and* $\bar{m}$ transitioning between $\bar{m}$ 'ground State' 7 (and $\bar{m}$ virtual image States 4, 5, 1 and $\bar{m}$ true image States 6, 3).

However, to complete the investigation of the time singularity nature of the entity $m = (\bar{m})^{-1}, \bar{m} = (m)^{-1}$, the outstanding status of State 5 and State 2 of Table 5 needs to be further addressed and investigated...

It is noted that State 5 and State 2 contain no virtual or true images but do have the ability to accommodate real entities (e.g. electrons and positrons).

That is, recall that for *'m'* to 'travel' or be 'transformed' from State 0 into State 5, $m's$ Dirac partner $\bar{m}$ *would similarily and simultaneously need to also* 'travel' or be 'transformed' from State 7 into State 2., as shown in Exhibit A4:

Table 5

State	Description	Υ	β	α	Description	State
0	$m(\alpha\ \beta_{\circlearrowleft}\ \Upsilon)$	1	1	1		0
2	$m_2'(\alpha - \beta_{\circlearrowleft}\Upsilon)$	1	−1	1	$\bar{X}(\alpha - \beta_{\circlearrowleft}\ \Upsilon)$	2
5	$\mathbf{X(-\alpha\,\beta_{\circlearrowleft} - \Upsilon)}$	**−1**	**1**	**−1**	$\bar{m}_2'(-\alpha\ \beta_{\circlearrowleft} - \Upsilon)$	**5**
7		−1	−1	−1	$\bar{m}(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$	7

Exhibit A4: State 0 to State 5 and State 7 to State 2 transitions within Table 5

That is, *both m and* $\overline{m}$ would undergo similar transforms but both will also carry respective *unchanged* $\beta_{\circlearrowright}$ *and* $-\beta_{\circlearrowleft}$ *directives* into these 5 /2 States (as indicated by the vertical arrows now superimposed on Table 5 in Exhibit A4**)**. That is, an electron from State 0 can transition to State 5 just as a positron can transition from State 7 to State 2. Thus, the significance of this '$\beta_{\circlearrowright}$ *conservation*' of *m* and the $-\beta_{\circlearrowleft}$ *conservation*' of $\overline{m}$ is that *both m and* $\overline{m}$ *retain their true (unchanged* $\beta_{\circlearrowright}$, $-\beta_{\circlearrowleft}$*) values, and hence real identities while resident in the* 5 /2 *States.* That is, both *m* and $\overline{m}$ will remain *conserved (True) entities* if and whenever they transition to State 5 /2.

Last, this author suspects entities *m* and $\overline{m}$ embedded in Table 5 were first theorised to exist as matter and antimatter particles by mathematician Paul Dirac in 1928. Barely five years later, US physicists Carl D. Anderson and Robert A. Millikan verified Dirac's prediction. In the 1933 issue of *Physical Review* [Vol. 43, p. 491 (1933)][7], Anderson and Millikan's article, titled 'August 1932: Discovery of the Positron', clearly presented the first-ever physical evidence of the existence of an antimatter particle in nature. They described the set-up of the Anderson-Millikan modified cloud chamber and how it successfully detected the first positron particle ever to be recorded. Next, the acclaimed photographic evidence presented in the 1933 article is also presented in this article (see Exhibit B4).

Exhibit B4 shows the Carl Anderson - Robert Millikan 1932 cloud chamber picture of the effects of cosmic radiation (in the form of a positron particle) entering at the bottom of the cloud chamber, and how the chamber was able to trace the pathway of the particle as it progressed through the chamber.

In Exhibit B4 the *observer* sees bubbles readily forming in the alcohol-rich vapour atmosphere of the chamber as the positron travels within the chamber. The trace shows a distinct curvature caused by the action of a strong magnetic field (which also surrounds and penetrates the chamber). The effect is of a particle seen entering the chamber from the bottom and travelling upwards to strike a lead plate in the middle and lose energy—as can be seen from the greater curvature of the upper part of the track. (The 1933 article then proceeds to prove that such a track can only be formed by the existence of an anti-electron ‘positron’ particle.)

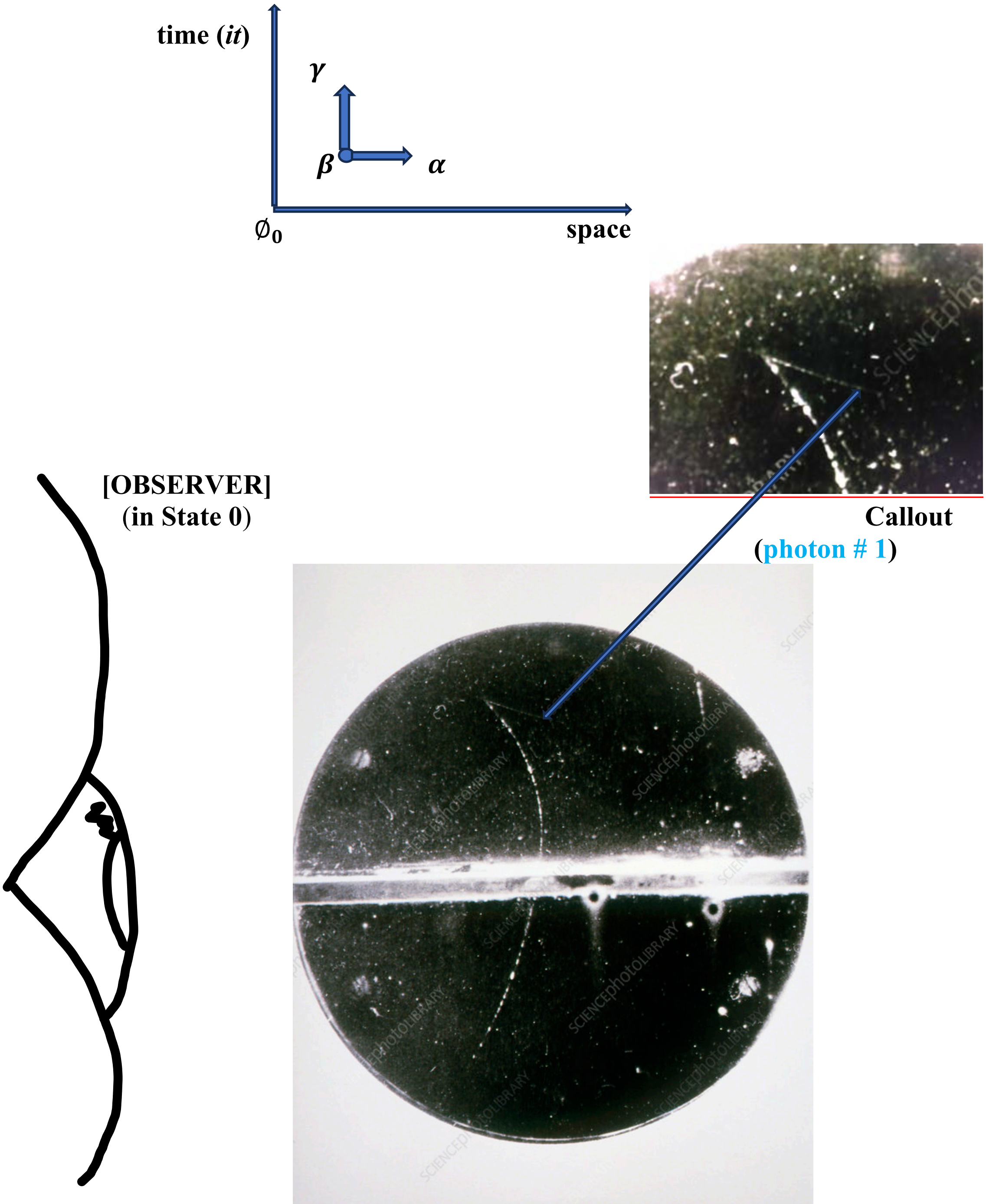


Exhibit B4: Carl Anderson - Robert Milikan 1932 cloud chamber photograph proving the existence of the anti-electron particle (positron)

However, what is also visible within Exhibit B4 is that the positron is seen travelling further up into the upper half of the chamber only to have its progress trace suddenly terminated. This is clearly seen by the observer and even more so in the callout of Exhibit B4. This callout also shows a secondary ‘bubble trace’ that is both less dense and much more linear than that of the positron’s path trace to date. This linear, lightweight trace is indicative of a secondary particle that has *no charge* and has even *less mass than that of the* positron. The only particle that meets such criteria of being ‘lightweight’ and ‘charge-less’ is that of the photon. Therefore, Exhibit B4 is a clear demonstration of not only the proven existence of the first positron ever formally reported in the literature but also the first clear photographic proof of positron annihilation.

State transfer mechanism shown in Table 5

The now apparent annihilation of the positron in Exhibit B4 (p. 54) is now investigated using the Table 5 states table, as follows:

Table 5

State	Description	Υ	β	α	Description	State
0	$m(\alpha\ \beta_{\circlearrowleft}\ \Upsilon)$	1	1	1		0
	electron					
2	$m_2'(\alpha - \beta_{\circlearrowleft} \Upsilon)$	1	−1	1	$\bar{X}(\alpha - \beta_{\circlearrowleft}\ \Upsilon)$	2
5	$X(-\alpha\ \beta_{\circlearrowleft} - \Upsilon)$	−1	1	−1	$\bar{m}_2'(-\alpha\ \beta_{\circlearrowleft} - \Upsilon)$	5
					positron	
7		−1	−1	−1	$\bar{m}(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$	7

Exhibit C4: State 5 and State 2 of Table 5

On the ‘*matter m* left-hand side’ of Table 5, an *electron* is shown transitioning downwards from a position corresponding to State 0 to a position corresponding to State 5 However, as noted earlier, the entity in State 5 has $-\alpha$ (a time travel direction *opposite* to the *electron* transitioning downwards), has $\beta_{\circlearrowleft}$ (i.e. the entity in State 5 *is a true version of the* *downward travelling electron*) and $-\Upsilon$ (i.e. there has been a change in the 'charge' directive of the *same* electron that has transitioned from State 0 to State 5).

Thus, what *is* in State 5 is an 'equivalent positron-type entity' of description $X(-\alpha\ \beta_{\mho}\ -\Upsilon)$.

Similarly, Exhibit C4 also shows the exact same but inverted scenario occurring for the right-hand side of Table 5: A positron in State 7 (which is the inverted electron of State 0) travels upwards from State 7 to State 2 as an equal 'equivalent electron-type entity' of description $\overline{X}(\alpha-\beta_{\mho}\ \Upsilon)$.

Now, the *action of the time singularity* (defining the relationship between States 5 and 2) effectively allows the mutual transfer of the 'equivalent positron-type entity' $X(-\alpha\ \beta_{\mho}\ -\Upsilon)$ in State 5 into an 'equivalent electron-type entity' $\overline{X}(\alpha-\beta_{\mho}\ \Upsilon)$ in State 2 and simultaneously the inverse transfer of the electron-type entity $\overline{X}(\alpha-\beta_{\mho}\ \Upsilon)$ of State 2 into the positron-type entity $X(-\alpha\ \beta_{\mho}\ -\Upsilon)$ of State 5.

That is, the *electron* initially transitioning from State 0 to State 5 enters State 5 as an equivalent positron, continues to transition into State 2 as an *equivalent electron* and then proceeds further downwards into State 7 as a *full-fledged electron*. Thus, the action of the (05 – 27) transitions results in the *creation* of entities +e in State 0 and −e in State 7.

Similarly, *the inverse (72 – 50) action* allows the *positron* initially transitioning from State 7 to State 2 to enter State 2 as an *equivalent electron*, continue to transition into State 5 as an *equivalent positron* and then proceed further upwards into State 0 as a *full-fledged positron*. Thus, the *inverse* action of the (72 – 50) transitions results in the simultaneous *annihilation* of entities +e in State 0 and −e in State 7.

These *creation* and *annihilation* mechanisms all occur through *the agency of the time singularity* of Table 5 and are now summarised in Exhibit D4:

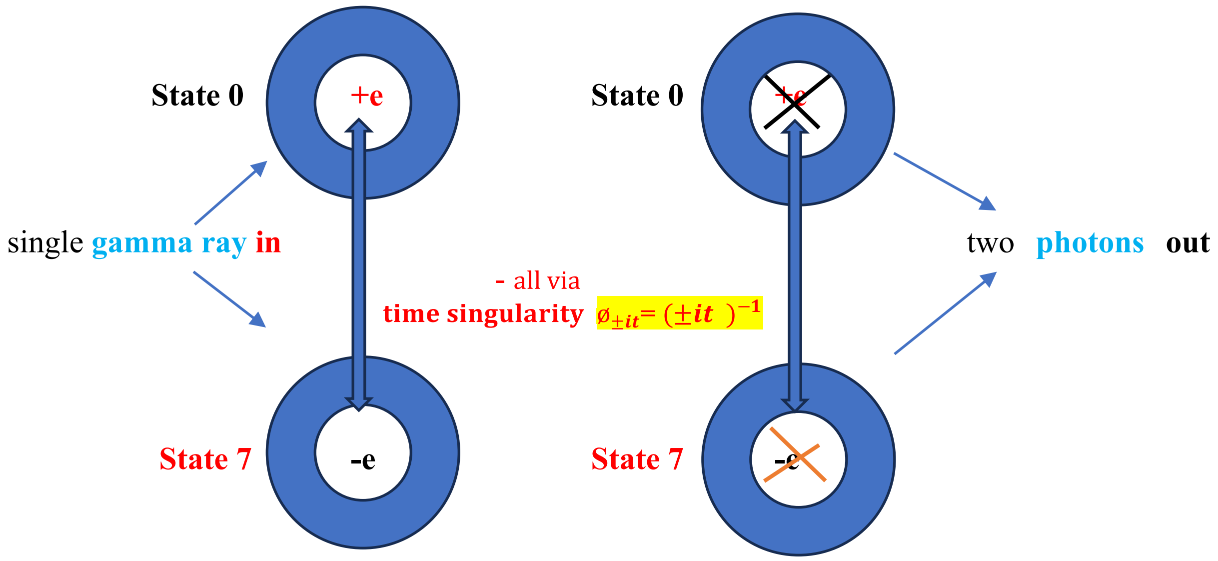


Exhibit D4 (a): electron – positron creation (via **annihilation** of **gamma ray in**) **(b): electron – positron annihilation** (resulting in the **creation** of **photons out)**

Thus, the situation depicted in Exhibit B4 can now be simply described as follows. A positron enters the cloud chamber upwards from the bottom direction, proceeds to track through the chamber until it encounters an electron in the upper hemisphere of the chamber, where it annihilates with a local electron in a flash of light designated as 'photon out' as in Exhibit D4 (b) and as captured photographically in the callout of Exhibit B4.

In contrast, Exhibit D4 (a) shows how the positron entering the cloud chamber first came into existence. Clearly, the positron involved in all of the above had to be *created* before it could be annihilated. The creation of the positron (and its associated antiparticle, the electron) can come about by gamma ray annihilation via a high-energy gamma ray decay event in Earth's upper atmosphere with the positron continuing its downwards path to be detected in the Anderson-Millikan cloud chamber as previously described.

To complete the note on positron annihilation within the Anderson-Millikan Cloud chamber experiment: Exhibit E4 now shows the equivalent situation as would be seen by an $\overline{\text{OBSERVER}}$ = OBSERVER in State 7.

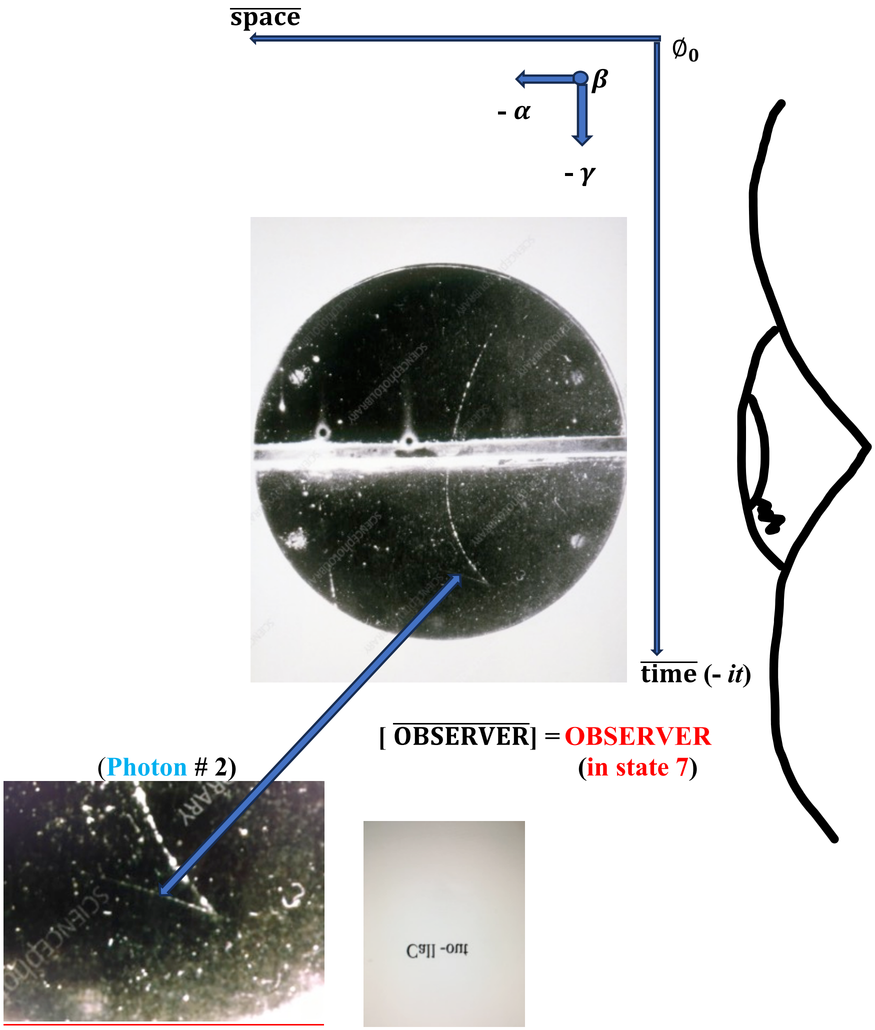


Exhibit E4: Simultaneous electron annihilation in State 7

In a repeat of the now-familiar time-inverted situation (as already witnessed in Exhibit D3 of Causal Experiment #2: film inversion), the observer in State 7 sees an *electron* annihilate with a positron in the upper hemisphere of *the cloud chamber—also* in a flash of light that can *be seen as Photon # 2 above and only by this observer*. Further (as expected), this second photon is seen propagating in the *exact opposite (reversed) time direction* as opposed to Photon # 1 in State 0 of Exhibit B4.

(Preliminary) Conclusion #8

Causal Experiment #3 (positron annihilation) shows that time inversion as expressed through the agency of the states table (Table 5) fully accounts for *all observations* recorded in and of the Carl Anderson - Robert Millikan initial positron cloud chamber experiment.

Relationship between the (05 – 27) and (72 – 50) transition actions of the states table (Table 5) and the productivity performance equation

The productivity performance equation

$$P_{p=\mu,\eta} = \mu\eta \tag{4}$$

has the utility of input resource factor μ *preceding* the productivity of process factor $\boldsymbol{\eta}$ just as the annihilation of the input (gamma photon) resource must precede the eventual *creation* of the output resource (two light photons) in the Anderson-Millikan cloud chamber experiment. This is the direct result of the *preservation of causality* embedded within the formulation of the performance measurement equation and is an *exact representation of the productivity performance of a time-singularity*-based productive system called 'nature'.

Further Investigation (& Discussion) of State Transfer Mechanism (05 – 27) and (72 – 50) within Table 5

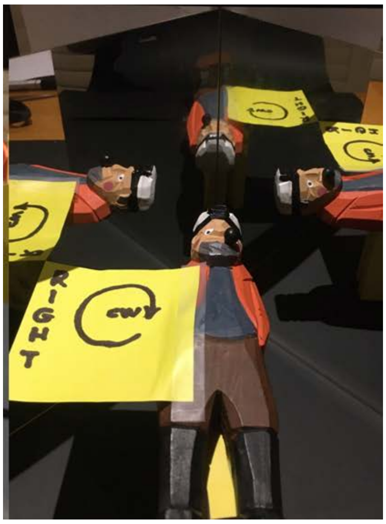
Next, the initial 'unidentified' status of State 5 within Table 5, that is, $X(-\alpha\ \beta_{\circlearrowright}\ -\Upsilon)$ is further investigated. It is noted that State 5 in Table 5 differs *only* from State 4 by a change in the α *quantum* from a '$+\alpha$' status in State 4 to a '$-\alpha$' status in State 5.

Table 5. States table of causal chirality (Experiment #1: mirror inversion)

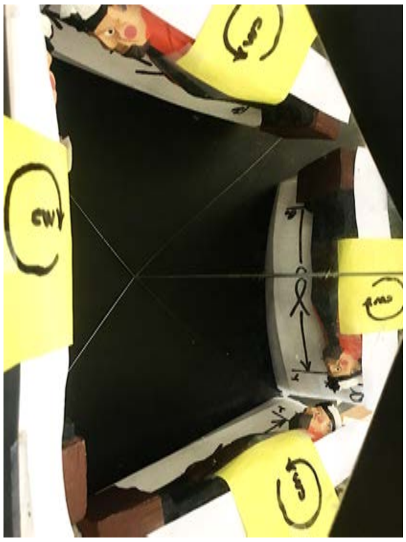
State	Description	Υ		β	α	Description	State
0	$m(\alpha\ \ \beta_{\circlearrowright}\ \ \Upsilon)$	1		1	1		0
1	$m'_{1\mathrm{T}}(-\alpha\ \ \beta_{T\circlearrowright}\ \ \Upsilon)$ $m'_{2\mathrm{T}}(-\alpha\ \ \beta_{T\circlearrowright}\ \ \Upsilon)$	1		1	−1	$\bar{m}'_3(-\alpha\ \ \beta_{\circlearrowright}\ \ \Upsilon)$	1

2	$m_2'(\alpha - \beta_{\circlearrowleft} \Upsilon)$	1		−1	1	$\overline{X}(\alpha - \beta_{\circlearrowleft}\ \Upsilon)$	2
3	$m_1'(-\alpha\ - \beta_{\circlearrowleft} \Upsilon)$	1		−1	−1	$\overline{m}_{3T}'(-\alpha - \beta_{T_{\circlearrowleft}}\ \Upsilon)$	3
4	$m_{3T}'(\alpha\ \ \beta_{T\circlearrowright}\text{-}\Upsilon)$	−1		1	1	$\overline{m}_1'(\alpha\ \ \beta_{\circlearrowright} - \Upsilon)$	4
5	$X(-\alpha\ \beta_{\circlearrowright}\ - \Upsilon)$	−1		1	−1	$\overline{m}_2'(-\alpha\ \beta_{\circlearrowright} - \Upsilon)$	5
6	$m_3'(\alpha - \beta_{\circlearrowleft} - \Upsilon)$	−1		−1	1	$\overline{m}_{2T}'(\alpha - \beta_{T_{\circlearrowleft}}\text{-}\Upsilon\ )$ $\overline{m}_{1T}'(\alpha - \beta_{T_{\circlearrowleft}}\text{-}\Upsilon\ )$	6
7		−1		−1	−1	$\overline{m}(-\alpha\ \boxed{-\beta_{\circlearrowleft}} - \Upsilon)$	7

State 4 was originally identified as the *tertiary-generated virtual TRUE image* $m_{3T}'(\alpha\ \beta_{T\circlearrowright}\text{-}\Upsilon)$ of TC and was first depicted as Exhibit H2: m_{3T}' ($\propto \beta_T$ -γ) (p. 44) of this article, reproduced as Exhibit I below for convenience):



<u>Exhibit I</u>: <u>Original Exhibit H2</u>: $\boldsymbol{m_{3T}'}$ **($\propto \boldsymbol{\beta_{T\circlearrowright}}$-$\boldsymbol{\gamma}$)**



<u>Exhibit J:</u> <u>Quaternary TRUE virtual image of TC</u>: $\boldsymbol{m_{4T}'(-\alpha\ \ \beta_{T\circlearrowright}\text{-}\Upsilon)}$

Shown next to Exhibit I is Exhibit J. In Exhibit J, TC is shown re-positioned in front of the *same split-mirror set-up* of Exhibit I but is now standing upright in front of the mirrors and rotated to face directly into the split-mirror set-up. The image generated in Exhibit J can be seen to be a *true image* of TC (the chirality marker is clockwise in the image as it is for TC standing up) together with a *reversal in the directives* ($\pm\propto$) and ($\pm\gamma$). Therefore, it is identified as a true (*quaternary*) image of TC with a designated descriptor: '$m'_{4\mathrm{T}}$(-α $\beta_{T\circlearrowright}$-$\Upsilon$)'.

Table 5 is now shown to be complete with State 5 registering $m'_{4\mathrm{T}}$(-α $\beta_{T\circlearrowright}$-$\Upsilon$) and State 2 registering the inverse entity $\overline{m}'_{4\mathrm{T}}(\alpha-\beta_{\circlearrowleft}\ \Upsilon)$:

Table 5. States table of causal chirality (Experiment #1: mirror inversion)

State	Description	Υ	β	α	Description	State
0	$m(\alpha\ \ \beta_{\circlearrowright}\ \ \Upsilon)$	1	1	1		0
1	$m'_{1\mathrm{T}}$(-α $\beta_{T\circlearrowright}$ Υ) $m'_{2\mathrm{T}}$(-α $\beta_{T\circlearrowright}$ Υ)	1	1	−1	$\overline{m}'_3(-\alpha\ \beta_{\circlearrowright}\ \Upsilon)$	1
2	$m'_2(\alpha-\beta_{\circlearrowleft}\Upsilon)$	1	−1	1	$\overline{m}'_{4\mathrm{T}}(\alpha-\beta_{\circlearrowleft}\ \Upsilon)$	2
3	$m'_1(-\alpha\ -\beta_{\circlearrowleft}\Upsilon)$	1	−1	−1	$\overline{m}'_{3\mathrm{T}}$(-$\alpha-\beta_{\mathrm{T}_{\circlearrowleft}}$ Υ)	3
4	$m'_{3\mathrm{T}}(\alpha\ \beta_{T\circlearrowright}$-$\Upsilon)$	−1	1	1	$\overline{m}'_1(\alpha\ \ \beta_{\circlearrowright}-\Upsilon)$	4
5	$m'_{4\mathrm{T}}$(-α $\beta_{T\circlearrowright}$-$\Upsilon$)	−1	1	−1	$\overline{m}'_2(-\alpha\ \beta_{\circlearrowright}-\Upsilon)$	5
6	$m'_3(\alpha-\beta_{\circlearrowleft}-\Upsilon)$	−1	−1	1	$\overline{m}'_{2\mathrm{T}}(\alpha-\beta_{\mathrm{T}_{\circlearrowleft}}$ -Υ) $\overline{m}'_{1\mathrm{T}}(\alpha-\beta_{\mathrm{T}_{\circlearrowleft}}$ -Υ)	6
7		−1	−1	−1	$\overline{m}(-\alpha-\beta_{\circlearrowleft}\ -\Upsilon)$	7

A Revelation:

It is now revealed that this author had 'no luck' in generating a *single-mirror quaternary virtual image*. That is, an entity with a required description of m'_4(-$\alpha-\beta_{\circlearrowleft}$-$\Upsilon$) on the m side of Table 5 was simply found *not to exist*! Yet, as the photo in Exhibit J clearly shows, we have already generated a *true version of such a 'missing' image.*

Question: What is going on?

How come we can generate a quaternary true virtual image $m'_{4\mathrm{T}}$(-α $\beta_{T\circlearrowright}$-$\Upsilon$) in State 5 of TC yet we cannot generate a relatively simple, straightforward single-mirror, quaternary, virtual image m'_4(-$\alpha-\beta_{\circlearrowleft}$-$\Upsilon$) of the same entity TC?

Answer:

The reason that $m'_4(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$ does not exist (as a separate 'single-mirror image' of TC) is because of the simple fact that an entity with the required *quanta descriptors* $(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$ *already exists*, but *not as a virtual entity*! The entity $(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$ is none other than *m's antimatter Dirac pair* $\overline{m}(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$!

To understand this, let us recall Exhibit I, presented when discussing '<u>Special Note on State</u> 7' (p. 43):

x ***α* - direction axis (into page)**

Exhibit I: TC $m(\alpha\ \ \beta_{\circlearrowright}\ \ \Upsilon)$ facing away into his α-direction axis

Exhibit I shows TC facing into his single mirror as *we (that is, as local observers) would also see him* when looking also in the direction of TC's line-of-sight vision and, therefore, Exhibit K (p.44) shows TC as *we would also see him but fully inverted*:

Exhibit K: TC completely (physically) inverted as $\overline{m}(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$

That is, Exhibit K is the exact same view we would have of the fully inverted TC *if we (and, therefore, also TC) were able to look directly through the time singularity itself* as illustrated in Figure 17.

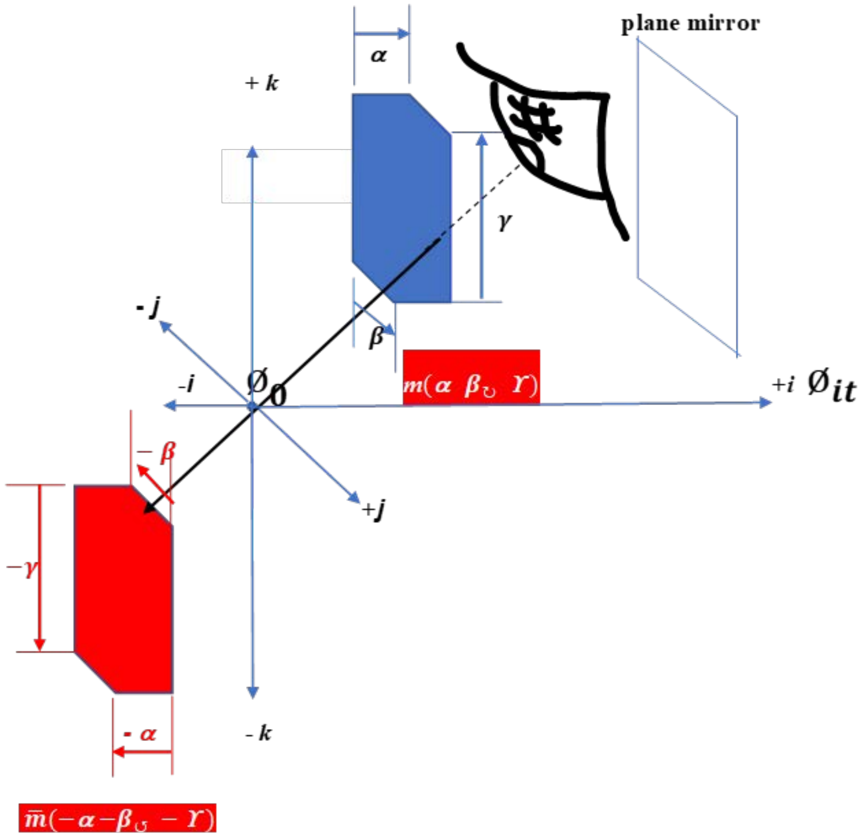


Figure 17. Imagined viewing of $\overline{m}(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$ directly through the time singularity: $\emptyset_{\pm it\ (at\ t=0)} \triangleq \emptyset_o$

Unfortunately, it is apparent neither TC nor we can consciously, simultaneously and physically look directly through the time singularity itself. This is simply because none of us can be consciously aware [i.e. note and log a 'lived experience'* reality time event] either within the time singularity itself or of seeing directly through the same said singularity. However, what we do experience is what Exhibit J (p. 60) itself shows: We can only experience a *perceived projected reality* that can be none other than a projection of the point

* The term 'lived experience' refers to the third realm of perceived reality, the other two being the realm of time and the realm of space.

reality of the time singularity itself.

Note: The above assertion concerning ‘point’, ‘projected’ and ‘perceived’ reality will be addressed in a follow-up article (currently in preparation) and is also referred to later in this article (p. 66) in the section titled **Summary of results and further investigations**.

Meanwhile, with respect to Table 5 (p. 61), Exhibit K (p. 62) again shows TC to have been completely (physically) inverted from an entity $m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon) -$ occupying State 0 in Table 5, into the entity $\overline{m}(-\alpha - \beta_{\circlearrowleft} \ - \Upsilon)$ occupying State 7 in the same Table 5—where TC’s $\beta_{\circlearrowright}$ directive has been obviously inverted to become $-\beta_{\circlearrowleft}$.

This again is demonstrated by starting with TC $m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon)$ <u>*facing away into his*</u> α - <u>*direction*</u> as per Exhibit L (reproduced below again for convenience):

x ***α - direction axis (into page)***
<u>Exhibit L: TC</u> $m(\alpha \ \ \beta_{\circlearrowright} \ \ \Upsilon)$ <u>facing away into his</u> α -<u>direction axis</u>

There we saw, in the normal viewing of a photo of a *true* image of the positron in action, it would be *equivalent to us being the electron* in State 0 seeing directly through the time inversion (i.e. seeing directly through the time singularity itself) and seeing its antimatter twin in State 7 in action as the $[(-\alpha \ \ \beta_{T\circlearrowright} \ \ - \Upsilon)]^{-1} \equiv \overline{m} \ (-\alpha - \beta_{\circlearrowleft} \ - \Upsilon)$ entity of <u>State 7</u>.

Thus, TC’s search for a single-mirror quaternary virtual image of himself (in State 7) would similarly be (of course) in vain. That is, he should simply have been *looking at himself* and *not at all in the mirror*! This (rather amazing) result leads to the following exciting and inescapable following conclusions:-

The '(05 – 27) and (72 – 50)' transition mechanism is, in effect, the direct mutual bidirectional, causal connection (pathway) through the time singularity itself between the *matter* entity m of State 0 and the (inverted) *antimatter* (Dirac-pair) entity $\overline{m}$ of State 7.

Therefore, this is argued to be *direct experimental evidence* of the singularity nature of time being simply

$$\text{ø}_{\pm it} = (\pm it\ )^{-1}$$

In addition:

The TRUE quaternary image of TC in Exhibit J (p.60) is none other than (indirect) photographic evidence of the existence of TC's i.e. $m(\alpha\ \ \beta_{\circlearrowright}\ \ \Upsilon)$'s Dirac-pair antimatter twin: $(\mathrm{TC})^{-1} = \overline{m}(-\alpha - \beta_{\circlearrowleft}\ - \Upsilon)$.

[NOTE: This claim is believed to be unique in all of the physical sciences' literature published to date]

(Preliminary) Conclusion #9

In general, because all entities $\pm(i\chi)^{-1}$ within this universe are now seen to be time $(\pm it)^{-1}$ - based, the following relationships are all held to be true:

$$\mu = \eta^{-1}$$

$$\eta = \mu^{-1}$$

$$(05 - 27)^{-1} = (72 - 50)^{-1}$$

and

$$(72 - 50) = (05 - 27)^{-1}$$

$$\text{creation} = (\text{annhilation})^{-1}$$

$$(\text{annhilation}) = (\text{creation})^{-1}$$

all because $$\begin{bmatrix} i\chi = (-i\chi)^{-1} \\ -i\chi = (i\chi)^{-1} \end{bmatrix} \qquad (19)$$

which leads to the following (preliminary) conclusion:

(Preliminary) Conclusion #10

The essence of ‘time’ is defined by the time singularity $\emptyset_{\pm it} = (\pm it\ )^{-1}$, which is the basis of the *very existence of all entities* $(\pm i\chi)$ within this universe and is the governor of all behaviour(s) witnessed and able to be recorded within the one and same universe.

Last, an overall graphical representation of all the theoretical and experimental results of this is presented in Figure 18:

Table 5

State	Description	Υ	β	α	Description	State
0	$m(\alpha\ \beta_{\circlearrowright}\ \Upsilon)$	1	1	1		0
1	$m'_{1T}(-\alpha\ \beta_{T\circlearrowright}\ \Upsilon)$ $m'_{2T}(-\alpha\ \beta_{T\circlearrowright}\ \Upsilon)$	1	1	-1	$\bar{m}'_3(-\alpha\ \beta_{\circlearrowright}\ \Upsilon)$	1
2	$m'_2(\alpha-\beta_{\circlearrowleft}\Upsilon)$	1	-1	1	$\bar{m}'_{4T}(\alpha-\beta_{T_{\circlearrowleft}}\Upsilon)$	2
3	$m'_1(-\alpha-\beta_{\circlearrowleft}\Upsilon)$	1	-1	-1	$\bar{m}'_{3T}(-\alpha-\beta_{T_{\circlearrowleft}}\ \Upsilon)$	3
4	$m'_{3T}(\alpha\ \beta_{T\circlearrowright}-\Upsilon)$	-1	1	1	$\bar{m}'_1(\alpha\ \ \beta_{\circlearrowright}-\Upsilon)$	4
5	$m'_{4T}(-\alpha\ \beta_{T\circlearrowright}-\Upsilon)$	-1	1	-1	$\bar{m}'_2(-\alpha\ \beta_{\circlearrowright}-\Upsilon)$	5
6	$m'_3(\alpha-\beta_{\circlearrowleft}-\Upsilon)$	-1	-1	1	$\bar{m}'_{2T}(\alpha-\beta_{T_{\circlearrowleft}}-\Upsilon)$ $\bar{m}'_{1T}(\alpha-\beta_{T_{\circlearrowleft}}-\Upsilon)$	6
7		-1	-1	-1	$\bar{m}(-\alpha-\beta_{\circlearrowleft}-\Upsilon)$	7

$$(+i\chi)^{-1} \qquad = \qquad (-i\chi)^{-1}$$

Figure 18. States table of $\boldsymbol{time\ singularity}\ \emptyset_{\pm it} = (\pm it\ )^{-1} - \boldsymbol{based}$ **universal entity** $(\pm i\chi)^{-1}$

Figure 18 fundamentally states that all universal entities are of a form $(\pm i\chi)^{-1}$ and that

‘All things in our universe are of the singularity nature of time.’

Summary of results, and future investigations

Summary Table 5 (Figure 18) clearly shows that time inversion is, in fact, the reality description of what we all call (Mother) 'nature'. Thus, it offers proof that matter entities exist not only in a +*it* time domain universe but also *simultaneously* exist as antimatter entities in the inverted time domain −*it* in and of the same universe.

[Note: How this 'state of affairs' can co-exist will be addressed (by this author) in a necessary follow-up series of studies dealing with a newly claimed body of knowledge tentatively called 'Time Singularity Physics' $(tsp)^{-1}$.]

The singularity nature of time also explains Einstein's so-called 'spooky action at a distance'. However, there is simply nothing 'spooky' about $(\pm i\chi)^{-1}$. This article has shown that the performance of $(+i\chi)^{-1}$ is the performance of $(-i\chi)^{-1}$ and vice versa. In fact, what the singularity of time implies is that *all entities* of form $(+i\chi)^{-1}$are completely *entangled* with their Dirac partners of form $(-i\chi)^{-1}$ and *vice versa*—from the time of their *mutual creation* to the time of their eventual *mutual annihilation.* That is, the 'mystery of entanglement' is no more a mystery by simply accepting that time has a singularity nature expressed as $(\pm i\chi)^{-1}$.

Table 5 (Figure 18) also clearly shows that an inversion-based *symmetry* is seen to occur within and among *all the states of nature.* That is, within Table 5, there is absolutely *no evidence* what so ever of 'symmetry-breaking' of any kind as often claimed today to exist in explaining certain phenomena of a 'quantum nature'. Table 5 reveals that all *true understanding* lies *within the inversion symmetry of the time singularity itself.* All we have to do is learn how to *look for the symmetries and then learn how to understand them.*

Last, the productivity performance equation offers a fundamental description of the universe, its causal nature and its ongoing evolution. Therefore, together with the concept of a (now) time singularity $(\pm it_{now})^{-1}$, the universal utility of resource, productivity of process performance equation $P = \mu\eta$ can be shown to offer a complete description of the reality of this universe and its ongoing performance characteristics over and throughout the realm of time. (However, this topic will necessarily have to be further investigated in one of the aforementioned 'follow-on' studies that this author intends to conduct.)

Overall Final Conclusion

This study has presented both theoretical considerations and experimental evidence as regards the existence of the singularity nature of time. Thus, all entities that exist in (*now*) time, which *move* in space and *learn* from lived experiences are of the same exact nature, namely,

$$\boldsymbol{i\chi = (-i\chi)^{-1}}$$

$$\boldsymbol{-i\chi = (-i\chi)^{-1}}$$

- **for all of time** $(\emptyset_{\pm it_{now}})^{-1}$

Conclusions

From the 10 (preliminary) conclusions:

(Preliminary) Conclusion #1

Because the basic resource of time underlies the very existence of all productive systems in nature and their universal (omnidirectional) performance measures of type $\overrightarrow{P_{p=\mu,\eta}} = \vec{\mu}\,\vec{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = (\overleftarrow{P_{p=\mu,\eta}})^{-1}$, time itself must, therefore, be declared an omnidirectional (universal) entity in and of its own right.

(Preliminary) Conclusion #2

Time is a naturally occurring oscillation that exhibits (as predicted) a continuous and ongoing unity of performance measurement at all times. This result occurs because the time singularity function itself, which is simultaneously the utility of input resource function $(\pm it)^{-1}$ and the productivity of process function $(\mp it)^{-1}$, has an overall utility-productivity performance measurement expressed collectively as follows:

$$\overrightarrow{P_{p=\mu_g,\eta_G}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

$$\overrightarrow{P_{p=\mu_g,\eta_G}} = \overrightarrow{\mu}\,\overrightarrow{\eta} = \emptyset_{\pm it}\,.\,\emptyset_{\mp it} = \emptyset_{\mp it}\,.\,\emptyset_{\pm it} = \frac{1}{\overleftarrow{\eta}}\,\frac{1}{\overleftarrow{\mu}} = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

$$\overrightarrow{P_{p=\mu_g,\eta_G}} = (\mp it)^{-1}(\pm it)^{-1} = (\pm it)^{-1}.(\mp it)^{-1} = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

$$\overrightarrow{P_{p=\mu_g,\eta_G}} = 1 = \left(\overleftarrow{P_{p=\mu_g,\eta_G}}\right)^{-1}$$

(Preliminary) Conclusion #3

The performance of entity $(+i\chi)^{-1}$on timeline $\boldsymbol{\emptyset_0} \longrightarrow \boldsymbol{\emptyset_{it}}$ is the *exact same* as that of its Dirac pair $(-i\chi)^{-1}$on timeline $\emptyset_{-it} \longleftarrow \emptyset_0$. That is,

$$\overrightarrow{P_p}(i\chi) = \overleftarrow{P_p}(-i\chi) \qquad (22)$$

(Preliminary) Conclusion #4

Equation (26) is the *effective embodiment of all preliminary conclusion statements made thus far*. Therefore, when treating nature as a time-based productive system, any experiment with such a system should at all times and in all circumstances clearly demonstrate the validity of Equation (26):

$$\begin{bmatrix} (\alpha\,\beta\,\Upsilon) = (-\alpha - \beta - \Upsilon)^{-1} \\ (-\alpha - \beta - \Upsilon) = (\alpha\,\beta\,\Upsilon)^{-1} \end{bmatrix} \qquad (26)$$

(Preliminary) Conclusion #5

If entity $\overline{\text{TC}}$ [aka: $-i\chi$, , $\bar{m}(-\alpha - \beta - \Upsilon)$] does exist in nature, then the results of the mirror experiment show that its behaviour (performance) will always (in every way and circumstance) perfectly match that of TC. This result can only come about if time itself is of a time singularity of form: $\o_{\pm it}$=$(\pm it\ )^{-1}$.

(Preliminary) Conclusion #6

The transition of entity TC [aka: $i\chi$, $m(\alpha\ \ \beta_{\circlearrowright}\ \ \Upsilon)$] into entity $\overline{\text{TC}}$ [aka: $-i\chi$] $\bar{m}(-\alpha - \beta_{\circlearrowleft} - \Upsilon)$ and vice versa is a natural action of the singularity of time. It is also the most energy-efficient process, given that it is inherent in the previously noted inversion and normalisation transfer functions of the time singularity itself.

(Preliminary) Conclusion #7

The time singularity function $\o_{\pm it}$ =$(\pm it)^{-1}$ allows for the immediate and accurate transfer of all real-time cause–effect (causal) and technological sequencing information between time domains (+*it*) and (−*it*) at all times (and in the most energy-efficient manner).

(Preliminary) Conclusion #8

Causal Experiment #3 (positron annihilation) shows that time inversion as expressed through the agency of the states table (Table 5) fully accounts for all observations recorded in and of Carl Anderson and Robert Millikan's initial positron cloud chamber experiment.

(Preliminary) Conclusion #9

In general, because all entities ($\pm i\chi$) within this universe are now seen to be time $(\pm it)^{-1}$ - based, the following relationships are all held to be true:

$$\mu = \eta^{-1}$$

$$\eta = \mu^{-1}$$

$$(05 – 27) = (72 \ - \ 50)^{-1}$$

$$(72 \ - \ 50) = (05 \ - \ 27)^{-1}$$

$$\text{creation} \ = (\text{annhilation})^{-1}$$

$$(\text{annhilation}) = (\text{creation})^{-1}$$

all because
$$\begin{bmatrix} i\chi = (-i\chi)^{-1} \\ -i\chi = (i\chi)^{-1} \end{bmatrix}$$

which leads to the following final (preliminary) conclusion.

(Preliminary) Conclusion #10

The essence of 'time' is defined by the time singularity $\o_{\pm it} = (\pm it \ )^{-1}$, which is the basis of the very existence of all entities ($\pm i\chi$) within this universe and is the governor of all behaviour(s) witnessed and able to be recorded within the one and same universe.

Overall conclusion

This study has presented a new approach to the research of time. It involved the direct application of performance theory to the field of physics in which nature itself was modelled as a naturally occurring productive system. Through the agency of the utility of input resource, productivity of process performance equation, nature modelled as a productive system was shown to require a unique *time singularity* as its basic transfer function. Consequently, it was proved that this time-singularity transfer function enables nature to be an ongoing generator of time (a natural oscillator), allowing not only all entities within the universe to exist in time, but to allow oscillatory *time itself* to be the basis of all such existence. Hence, this study has clearly presented and proved the *hypothesis* that *all entities in the universe have the exact same nature in time as time itself*, and therefore, *'All things are of the singularity nature of time.'*

Possible areas for further research

The application of performance theory to the body of knowledge called physics has mutual benefits. Certainly, performance theory has demonstrated its ability to contribute to a new and different understanding of a basic tenet of physics, namely, 'time', but the inverse is also true. (For example, physics indicates that given a 'performance' is simply the 'doing of work', performance per se is really just the real [time] realisation of the potential in any input resource to become something else and that evolution itself is nothing more than the ongoing realisation of the same said potential ...until evolution somehow eventually comes to some sort of triggered end...?

Now, even though physics may indicate that performance theory itself could well be as fundamental as physics in explaining nature, *maybe* performance theory is only but a single body of knowledge and physics another, and the real reveal is as follows: *All good bodies of knowledge ~~ought~~ to (no <u>must</u>) mutually reinforce one another*. And, possibly, therefore, as an obvious extension: *There is only but one true body of knowledge, and that must reside within the time singularity itself* (there being no other obvious candidates to choose from).

Last, just to reinforce these statements, reconsider the identity:

$$\begin{aligned} i\chi &= (-i\chi)^{-1} \\ -i\chi &= (i\chi)^{-1} \end{aligned} \qquad (19)$$

When expressed in the language of Gödel[8], if $i\chi = (-i\chi)^{-1}$ is the *axiom* to a performance theory, where entity χ is the performance measure $P_{p=\mu,\eta} = \mu_g \eta_a$, and where the *proof* is simply $-i\chi = (i\chi)^{-1}$, then this simply implies

$$(axiom) = (proof)^{-1}$$

$$(proof) = (axiom)^{-1}$$

which means Gödel's 'incompleteness' theorems (if correct) would imply we have absolutely no idea of what the cause of time could actually be.

This author begs to differ: Energy is the χ within $i\chi = (-i\chi)^{-1}$ and is a quantum of energy that indeed lies outside of the proof area of $-i\chi = (i\chi)^{-1}$. That is, this study has shown that energy is the not only a resource that can exist outside of the time singularity, pass through the time singularity and reside within the same time singularity, it has been conclusively shown that energy itself is the very source of the one same time singuarity!

Therefore, to claim $-i\chi = (i\chi)^{-1}$ as being an unprovable axiom, where χ is this energy, is simply wrong.

Conclusion: Gödel's incompleteness theorems are simply wrong. Energy is the fundamental resource lying outside the domain of time *and* the time singularity $ø_{\pm it} = (\pm it\ )^{-1}$ itself is indeed not only 'complete' but also, by any meaningful definition of the word 'completeness', the foundation energy and the time singularity itself must, therefore, be the *complete and only source* of all knowledge and information in the entire universe!

This last statement will no doubt be of interest to a few mathematicians and perhaps, also to a few theologians.

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