

# A tale of two logics

Dipak Kumar Bhunia

[Researcher in theoretical physics with published works and books.]

[There are two types of basic logical patterns – deterministic and probabilistic – which are flowing in all deeper levels of nature, are also created two different folds of the same. Those folds are as if two sets of all elements in the nature. The Physics and Mathematics are the studies of that whole nature, and there are also two folds – deterministic and probabilistic – for both Physics and Mathematics. Since the Physics and Mathematics share the same elements in those two folds of nature, also there would be the same deterministic and probabilistic logical connections in-between the corresponding two folds of Physics and Mathematics as well.]

## I. Nature<sub>(1)</sub>

The cognitive intelligence in *Homo sapiens sapiens*<sub>(2)</sub> is immensely powered by the nature through *primary tools* like eyes, ears, noses, tongue, skin, and psyche as if to realize that nature how it is. Although, that nature has a diverse bio-sphere in this planet with other countless species and varying levels of intelligences from ‘photo-chemically reflective’ to ‘sensory responsive’ capacities; but no one has up to the mark cognitions as the previous one possesses. It is also not yet known whether there any other cognitive intelligence(s) co-exists somewhere in nature which is (are) superior to the *H. s. sapiens*. But, if those candidates do exist, they would have extra-terrestrial origins, (and probably, are now eagerly waiting to receive any ‘effective’ communications from this planet to response!). In such a situation, there would be no guarantee that such an extra-terrestrial might have definite superiority in cognitive intelligences. Therefore, in proceeding text, the *H. s. sapiens* would be considered to have recognizable preeminence among others. However, that preeminence is now also booming through huge range of technologies as additional *secondary tools* to magnify the existing scopes and reaches of the primary tools.

### A. Two Folds:

**Deterministic**<sub>(3)</sub> : But, one unavoidable intrinsic hard reality with the *H. s. sapiens* – with all its primary and secondary tools – is that, all of their direct fundamental process of communications with the nature are through exchanges of any form of quantized signal(s) or impulse(s) with discrete-characteristics<sub>(4)</sub>. Then, all direct cognitive intelligences of *H. s. sapiens* about the nature must be limited up to any quantized or discrete phenomenology in nature due to such dependence on the quantized signaling process of communications. Then, if there any other forms of non-quantized or non-digital or analog phenomena take place in the

same nature, those would be always beyond the direct means of cognitive intelligences of that H. s. sapiens.

On other hand, conceptually, such cognitive intelligence, along with its entire primary and secondary tools, is nothing but a sum of quantized ingredients which are further integrated with the total quantity of 'quantized-physical-entities' <sup>(5)</sup> or 'quantized-hardwares' exist in the whole nature. As a result, any such 'quantized cognition of intelligence' (QCI) with basic discrete-characteristics never could be separated from the total quantized-hardwares of the nature. Then QCI appears as one of inseparable ingredients of the nature.

An event, which becomes realizable to that QCI through the exchange of any quantized signal, appears as a prior-state of that event, and from which the QCI can causally or deterministically predict all its future states. If no such quantized signals emerge from such event to receive, the QCI cannot determine precisely a prior-state to predict such future-states. That is, the QCI appears as if 'comfortable' with determining any event associates with quantized physical entities or hardwares which are communicable only through any direct quantized signals. Hence, the QCIs would have an intrinsic type of "casual" or "deterministic" type direct realizations about the events in nature. Therefore, if through all such direct perceptions, every event in the immediate nature appears as causal or deterministic, then nature would automatically appear to such a QCI as sum of all causal or deterministic 'softwares' to unfold all the quantized-physical-entities or hardwares within it. There are all similar kind of causal or deterministic softwares observe in surrounding deterministic nature: the softwares to run the computers, DNA to unfold a life, unfolding of the post big bang universe, metamorphosis of ecological and environmental systems on earth from beginning to its present, even in socio-economic genesis of human society through the ages, and there still so many. That is, the QCI, which is inseparable with the quantized-hardwares of the whole nature and possesses an intrinsic type of "casual" or "deterministic" type direct realizations about any events in nature, would have no other choices except to be a part of those whole causal or deterministic softwares in same nature.

As a result, the nature which is unfolding with the QCI would appear comprised by three broad groups of basic parameters: all quantized-hardwares, all deterministic or causal softwares, and QCIs; and for convenience, that part of nature could be termed as *deterministic fold*.

**Probabilistic <sup>(6)</sup>:** On contrary, it is not precisely known whether there any other 'form' of natural existence(s) beyond that deterministic fold which can be communicable through quantized-signals and causal limits of the QCIs in the same nature. Because, it is totally vague, how an intrinsically causal QCI can communicate directly with that part of the nature, which never emits any kind or form of conventional quantized signals or impulses in any scales <sup>(7)</sup> from there. Even, that part not necessarily be exist in the regions like dark matters or dark energies; although those are still challenges to QCIs (to innovate some more sophisticated secondary tools) to craft a proper quantized signal communications with these zones. However, that can be possible to subsist even beyond those zones of dark matters and energies as conjectures not merely in terms of zero communications with the QCIs through all known or unknown quantized signals, but that zone could also be untraceable too through the calculations of total mass-energies of the universe unlike dark matters or dark energies. If any such zone does exist

somewhere in nature, beside above deterministic fold, what would be the form of any hardwares and softwares there? How that fold would operate with those parameters?

However, there are still some indirect evidences, from which it can conjecture to be unfolded with different kinds of softwares or programs unlike QCIs in the same nature i.e. are in non-quantized or analog or virtual ways. There are many events within uncertainties out of conventional quantized-signaling processes of QCIs from where either there cannot be defined any precise prior-state of the events or from one defined prior-state of event there would be no future states for causal predictions. That makes some of the events in the same nature as if are followed some unknown programs or softwares with broken causality or indeterministic ways, i.e. as if there are signatures of consciousness. For example, an electron in atom can be evidence for to and fro shifting in-between domains of real and virtual parts or say deterministic fold and *probabilistic fold* of the nature; where virtual means, from where no real quantized signals come out to QCIs. This hints that there is another part in the same nature which is beyond the quantized causal limit of QCIs in deterministic fold. Where, merely by following a causal software convenient in deterministic fold for QCIs, one cannot predict precisely from where, when and how that shifting of an electron would taken place from a virtual (as prior-state) to its real existence (future-state), or vice versa. Similarly, there are statistical or probability theorems, imaginary numbers, concepts of absolute zero & infinity, and so on which never could be defined directly in deterministic fold of QCIs through any direct real quantized signal exchanges.

Then, one can suppose, there may be another part co-exist in the same nature, which would be non-quantized, probabilistic or non-causal or conscious in types. That is, in that part of nature, there would be another pattern of software or program which operates differently compare to the deterministic fold of QCIs. Hence, if there imagine to exist any intelligence (contrary to the QCIs), which might be conversely intrinsic communicable with the nature only through any kind of non-quantized signaling processes and also inseparable with that non-quantized part of the nature, that must have a 'non-quantize cognition of intelligence' (NQCI). Obviously, such an NQCI, which is formed by 'non-quantize physical entities' (8) or 'non-quantized hardwares' could be beyond the cognitions of the QCIs. However, that NQCI would be familiar too with all 'probabilistic or non-causal or conscious pattern of softwares' to communicate directly with all non-quantized physical entities or non-quantized hardwares in nature. As a result, the NQCI would realize that he/she unfolded with a nature, that comprises with three broad groups of basic parameters: non-quantized hardwares, probabilistic or non-causal softwares, and NQCIs; and for conveniences, that part of nature could be termed as a *probabilistic fold*.

## B. Two Sets:

**Deterministic Set:** Then the deterministic fold of nature – which comprises all quantized parameters or elements in three broad groups: (i) a sub-set of all quantized physical entities or hardwares say

$$A = \{a_1, a_2, \dots, a_n\} \quad (1)$$

for all possible scales and numbers of those quantized physical entities in nature as elements in the group; then (ii) a sub-set of all possible deterministic or causal softwares say

$$B = \{b_1, b_2, \dots, b_m\} \quad (2)$$

as elements in that group; and (iii) a sub-set of all possible QCIs say

$$C = \{c_1, c_2, \dots, c_r\} \quad (3)$$

as elements in that group. Then, for the deterministic fold in nature, there would be a universal set for union among all elements in three sub-sets A, B, and C in above Eqs. (1), (2) & (3) respectively as

$$X = \{A, B, C\} = A \cup B \cup C \quad (4)$$

Or

$$X = \{a_1, a_2, \dots, a_n, b_1, b_2, \dots, b_m, c_1, c_2, \dots, c_r\} \quad (5)$$

inclusive of all parameters irrespective of scales, states and numbers in nature.

**Probabilistic set:** The probabilistic fold in above paragraphs would also comprise other three broad groups of parameters: (i) with a sub-set of non-quantized physical entities or hardwares say as

$$D = \{d_1, d_2, \dots, d_n\} \quad (6)$$

for all possible states and quantities of non-quantized physical entities as elements in the group; (ii) a sub-set of probabilistic or non-causal softwares, say as

$$E = \{e_1, e_2, \dots, e_m\} \quad (7)$$

for all possible states and quantities of probabilistic ways of softwares as elements in the group; and (iii) a sub-set of the NQCI's say as

$$F = \{f_1, f_2, \dots, f_r\} \quad (8)$$

for all possible states and numbers of NQCI's as elements in the group. Then, for such a probabilistic fold in nature, also there would be another universal set for union of all elements in three sub-sets D, E, and F in above Eqs. (6), (7) & (8) respectively as

$$Y = \{D, E, F\} = D \cup E \cup F \quad (9)$$

Or

$$Y = \{d_1, d_2, \dots, d_n, e_1, e_2, \dots, e_m, f_1, f_2, \dots, f_r\} \quad (10)$$

that includes all parameters irrespective of states and quantities of non-quantized parameters in nature. Then whole nature would appear as one single set from the union of both  $X$  in Eq.(5) and  $Y$  in (10) say as

$$Z = X \cup Y \quad (11)$$

for every elements it.

### C. And Two Proto-Logics:

**Deterministic-Logic:** Why those two folds or sets  $X$  &  $Y$  of nature are fundamentally so different? The deterministic fold in Eq.(4) has appeared with three broad groups: quantized hardwares, deterministic or causal softwares, and QCI's. The same broad groups of elements can also be termed as quantized hardwares, quantized softwares and QCI's as well in deterministic fold. Since, in that deterministic fold for  $X$ , everything realizes in deterministic patterns through any intrinsic process of quantized signaling, the every element in all sub-sets of  $X$  must follow a *basic logic* of causality or determinism. Then all those three broad groups of elements could be also termed respect to A in Eq. (1), B in Eq.(2) and C in Eq.(3) as deterministic-hardwares, deterministic-software's and deterministic-QCI's.

Then the deterministic fold appears as a stream of basic patterns of proto-logical flow, through which everything within it is as if folding or unfolding accordingly. That is, all diverse elements ranging from all deterministic-hardwares to all deterministic-softwares to all deterministic-QCIs in sub-sets A, B, and C in Eqs. (1), (2), & (3) in  $\mathbb{X}$  in Eq. (5) would basically **connected** by that proto *deterministic-logic*.

**Probabilistic-Logic:** Alternatively, however, being a dependent observer in unfolded deterministic fold it seems impossible for a QCI to be compatible with the patterns of programs that exists in probabilistic fold beyond quantized causal limitations. But conversely an NQCI would be very much compatible with the softwares of probabilistic fold  $\mathbb{Y}$  in nature in Eq. (10), and with the three broad groups or sub-sets of correspond to D in Eq.(6), E in Eq.(7), and F in Eq.(8) as non-quantized hardwares, probabilistic softwares, and NQCIs. Since all those elements in three broad groups are basically non-quantized in characteristics, same groups could be also termed as: non-quantized-hardwares, non-quantized-softwares, and NQCIs. Not only that, since in such a probabilistic fold everything appearing in probabilistic patterns, all those elements in three broad groups in sub-sets of A in Eq. (1), B in Eq.(2) and C in Eq.(3) respectively could also be termed as probabilistic-hardwares, probabilistic-softwares and probabilistic-NQCIs.

Then on contrary, the probabilistic fold for set  $\mathbb{Y}$  of nature in Eq. (10), everything would appear in probabilistic patterns through intrinsic non-quantized signaling; and most importantly, every element in all those sub-sets would operate through another *basic logic* of non-causality or indeterminism. That might be also another fundamental stream of basic pattern of proto-logical flow in the same nature, through which everything within that probabilistic fold of nature would be folding and unfolding accordingly. Then, all the diverse range of elements in the sub-sets like D in Eq.(6), E in Eq.(7), and F in Eq.(8) in  $\mathbb{Y}$  of Eq.(10) would appear basically **connected** by that proto *probabilistic-logic*.

## II. Physics and Mathematics:

### A. Two Physics and two Maths:

The whole nature, as envisaged in above  $\mathbb{Z}$  in Eq.(11), is an appearance – which might be both with or without necessities of the QCIs in Eq.(3) and NQCIs in Eq.(8), but probably never be without the existences of A & B in Eqs.(1) & (2) and D & E in Eqs.(6) & (8). Moreover, both of the QCIs & NQCIs are ultimately nothing but the products of deterministic hardwares & softwares in Eqs. (1) & (2), and probabilistic hardwares & softwares in Eqs. (6) & (7) respectively. Then, whole nature in its both folds as if fundamentally blended with some corresponding primary hardware & software parameters only; and where QCI & NQCI in same folds are secondary parameters emerged out of those same primary hardwares and softwares. Therefore, it seems that both of the deterministic as well as probabilistic folds are as if less bothered about the secondary presences of corresponding observers or QCI and NQCI in the processes of folding and unfolding of the nature. That is, in deterministic fold in Eq.(4) the role of sub-sets A & B and in probabilistic fold in Eq.(9) the role of sub-set D & E envisaged as the primary parameters in the process of corresponding folding and unfolding; where the roles of C in Eq.(4) and F in Eq.(9) as secondary parameters.

However, if physics and mathematics are considered as the primary subjects to study about mechanisms involved in primary hardware and software parameters of the whole nature respectively, then alternately cyber sciences being a secondary subject comprising both of the physics and mathematics in studying the mechanisms involved in secondary parameters like QCI and NQCI parameters as well.

**Deterministic physics & math:** To study about the mechanisms involved in primary hardware & software in the deterministic fold  $\mathbb{X}$  with sub-sets A, B & C in Eq.(4) would be the domain for a special pattern of both physics and mathematics, i.e. the domains of deterministic physics and deterministic mathematics. However, there are majority areas in both physics and mathematics which are contributed to study the mechanisms in that deterministic domain. In physics that are from the Newtonian mechanics to relativity and quantum mechanics excluding uncertainty. In mathematics anything, that would satisfy a basic rule of a function, e.g.

$$y=g(x) \quad (12)$$

that allows to make predictions of  $y$  based on known value(s) of  $x$ . The physical laws, which can be explained by the differential equations, would be deterministic. The chaos theory to study proceedings of system would be deterministic if its initial data are known. There are many more.

**Probabilistic physics & math:** Alternately, the probabilistic fold possesses sub-sets D, E & F in Eq.(9) which needs a domain for another pattern of physics and mathematics, that would be the probabilistic physics and mathematics. Those are emerged mostly from the principles of uncertainty related to locations of an event in micro level space & momentum, time & energy etc. That is, from the above paragraphs, as if those events which are gradually getting micro-er and exchanging fainter quantized-signals with QCI to be realized as gradually moving towards indeterministic. Then more and more statistical or probabilistic locations of event come into play to get any prior-state of the event precisely. The statistical probability theory, stochastic process and up to some extent the random processes are few areas in probabilistic mathematics. That is, it would become impossible to predict  $y$  in Eq. (12) as a function of  $x$  after certain levels and instead becomes probabilistic speculations by the QCIs. But it has assumed in above Eq. (9) that the NQCI could precisely predict that  $y$  through its own ways of probabilistic-logics in probabilistic fold.

## B. Sharing of Common Elements:

**In deterministic set:** Since physics and mathematics are primary subjects to study about mechanisms involved with all primary hardware and software parameters of the whole nature respectively, such a set for whole physics and mathematics would share every sub-sets and elements of the set  $\mathbb{Z}$  in Eq. (11). Then equally, all the elements in a set for the whole deterministic physics and mathematics would share the every sub-set and elements of the deterministic fold of  $\mathbb{X}$  in Eqs. (4) & (5); and for that set of whole deterministic physics and mathematics there would have say

$$\mathbb{X}_{P\&M} = \mathbb{X} \quad (13)$$

then a deterministic physics sub-set would equally share every elements in the sub-set A for deterministic primary hardware elements in Eq. (1) say as

$$A_{DP} = A = \{a_1, a_2, \dots, a_n\} = \{a_1, a_2, \dots, a_n\}_{DP} \quad (14)$$

and the deterministic mathematics sub-set would similarly share every elements in sub-set B for deterministic primary software elements say as

$$B_{DM} = B = \{b_1, b_2, \dots, b_m\} = \{b_1, b_2, \dots, b_m\}_{DM} \quad (15)$$

and for the secondary cyber sciences for both deterministic physics and mathematics would share every elements in sub-set C in Eq.(3) for deterministic-QCIs say

$$C_{DP\&M} = C = \{c_1, c_2, \dots, c_r\} = \{c_1, c_2, \dots, c_r\}_{DP\&M} \quad (16)$$

respectively.

**In probabilistic set:** Conversely, all the sub-sets and elements in set Y in Eqs. (9) & (10) for the probabilistic fold would share by a set for the whole probabilistic physics and mathematics say

$$Y_{P\&M} = Y \quad (17)$$

and from the Eq.(6) there would be the sharing of all elements in sub-set D by the sub-set of probabilistic physics as

$$D_{PP} = D = \{d_1, d_2, \dots, d_n\} = \{d_1, d_2, \dots, d_n\}_{PP} \quad (18)$$

and sharing of all elements in sub-set E in Eq.(7) by the sub-set of probabilistic mathematics say

$$E_{PM} = E = \{e_1, e_2, \dots, e_m\} = \{e_1, e_2, \dots, e_m\}_{PM} \quad (19)$$

and for the conceptual secondary cyber sciences from the probabilistic physics and mathematics would share the every elements in sub-set F in Eq.(8) for probabilistic-NQCs as

$$F_{PP\&M} = F = \{f_1, f_2, \dots, f_r\} = \{f_1, f_2, \dots, f_r\}_{PP\&M} \quad (20)$$

respectively.

### III. Connections

#### A. Deterministic Connections between Physics and Mathematics:

It has envisaged in above paragraphs, especially in paragraph “Deterministic-Logic” under I.C. that there is a proto deterministic-logic which would be common in every sub-sets and elements of X in Eq.(5) to unfold or fold the deterministic part (fold) of the whole nature including all QCIs. Therefore, such a common and basic deterministic-logic connects all those elements in sub-sets A, B & C in Eqs. (1), (2) & (3) respectively. Since the set  $X_{P\&M}$  for deterministic physics and mathematics shares all and every sub-sets & elements in set X in Eq. (13), there must be that same common and basic deterministic-logic too which would connect all those sub-sets & elements in Eq. (13). Then, the Eqs. (14) & (15) also would be also as

$$A \cup B = A_{DP} \cup B_{DM} \quad (21)$$

where the sub-sets of deterministic physics ( $A_{DP}$ ) and mathematics ( $B_{DM}$ ) as like as deterministic hardwares (A) and softwares (B) sub-sets would be connected by the same common and basic deterministic-logic as an inseparable part of the deterministic fold.

#### B. Probabilistic Connections between Physics and Mathematics:

Conversely, in above paragraph “Probabilistic-Logic” under same I.C. it has also realized that there is an existence of another basic logical pattern e.g. proto probabilistic-logic which would be common in every sub-sets and elements of  $\mathbb{Y}$  in Eq.(10) to unfold or fold the probabilistic part (fold) of the whole nature including all NQCI. Then from Eqs.(18) & (19) we must have

$$D \cup E = E_{PP} \cup B_{PM} \quad (22)$$

where the sub-sets of probabilistic physics ( $E_{PP}$ ) and mathematics ( $B_{PM}$ ) would be as like as the sub-sets of probabilistic hardwares (D) and softwares (E) must be connected by that same proto probabilistic-logic as an inseparable part of the probabilistic fold of nature.

#### IV. Conclusions

- A.** Math and Physics – no matter whether are deterministic or probabilistic – have respective prototype deterministic or probabilistic logical connections as a “Truth” not as a “Trick”.
- B.** One type of cognitive intelligence unfolded with any of such respective logical prototype cannot be comprehended another prototype of logical cognition.

**[Concluding Note:** Therefore, it may be also possible that, what this author has written so far in above can be probabilistically wrong and be able to make him ultimately just a virtual fool – due to his inherited biasness over deterministic-logics and infections in rational DNAs by causal syndromes while drawing a model probabilistic virtuality of an NQCI in nature.]

#### Foot Notes:

- 1. Nature:** conceptually consists of everything including one or many universe(s), all scales of wave-corpuscular phenomena by means of all causal and con-causal forms.
- 2. Homo sapiens sapiens:** the subspecies of *Homo sapiens* that includes all modern humans, the bipedal primate having language and ability to make and use complex tools; brain volume at least 1400 cc.
- 3. Deterministic:** determinism is taken to meaning of causal determinism, which in physics is known as cause-and-effect. It is the concept that events within a given paradigm are bound by causality in such a way that any state (of an object or event) is completely determined by prior states.
- 4. Discrete characteristics:** the opposite of continuous - something that is separate, distinct and individual. It refers to: discrete particle or quantum in physics, and also discrete signal or discrete-time signal is a time series consisting of a sequence of quantities or in other words, it is a time series that is a function over a domain of integers.
- 5. Quantized physical entities:** the sum of quanta (singular: quantum) for any physical property of an entity which is "quantized," and refers to "the hypothesis of quantization", that means that the magnitude can take on only certain discrete values.
- 6. Probabilistic:** the lack of certainty. A state of having limited knowledge, where it is impossible to exactly describe the existing state, a future outcome, or more than one possible outcome. It refers to the the measure of likeliness that an event will occur, say, in-between 0 and 1 (where 0 indicates impossibility and 1 indicates certainty). The higher the probability of an event, there would be more certainty that the event may occur.



**7. Quantized signals or impulses in any scales:** A quantized signal or impulse refers any discrete form of particle or a sum of particles. The particles in nature have existences in different groups or scales ranging from micro to macro. Example: all photons of a particular magnitude of wavelength in nature are under same scale, and other different magnitudes of wavelengths or mass-energies would have respective different scales.

**8. Non-quantized physical entities:** Anything that is continuous or analog with no discrete values and that cannot be communicated through any quantized signaling processes.