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NATURAL MODEL

The present chapter and especially its sections "Physical Bodies" and "Space" is based upon Einstein's "PHYSICS AND REALITY", which it intends to refine and to complement.

Einstein presents the natural model as interplay of sensations and abstractions, lacking the I00 essential imagery, necessary for memorizing, recalling and manipulating Einstein's "physical bodies" or percepts. Einstein was mainly interested by the physical reality and restricted the mental input to sensations or percepts. Imagery, while supporting percepts deals as well with abstract, emotional and recursive input, extending the "physical reality" over the entire human universe of discourse.

Thus extended imagery supports "mental experiments", whose events are projections of abstract concepts, of emotions or images brought about recursively by analogy with known ones. Mental experiments support the main part of human creativity. Abstract input supports pure mathematics and - together with the recursive - natural science starting with fundamental physics. Emotional input supports esthetics, ethics and a good part of psychology and sociology.

We asserted in "STRUCTURES OF MIND", that sensations, though stemming arbitrarily from unknown transcendancy, trigger ordered immanent "reality" of images and, that mind's faculty of cognition guides us through their labyrinth allowing to survive, to reproduce and to avoid oncoming buses. Mind can thus be seen as a natural model developed by evolution to enable and to support the survival of human species.

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While accepting with Einstein that "reality" is merely an illusion, in every day life one takes it at its face value, uses mind's natural model instinctively and leaps to the side to avoid the bus, without cogitating about its illusionary epistemological character.

This instinctive attitude taking the illusion of reality at its face value is known as "common sense". It guided original humans in their struggle for survival directly as individuals and socially by dint of natural languages (see the following chapter).

PHYSICAL BODIES

The first step in the setting of the physical reality is the formation of images of "objects", or, to comply with Einstein's terms - "physical bodies".

Out of the multitude of his event-images one takes, mentally and arbitrarily, certain repeatedly occurring patterns of sensations, and collects them into a secondary image under a particular symbolic name. One attributes to this name its originating secondary image as meaning, thus constructing a meaningful concept of a particular "body".

It's crucial to emphasize that one intuits such secondary constructs as unshakably certain and "real", unlike their originating percepts affected by doubt and uncertainty and that finally, one conceives the "physical world" as populated with them.

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SELF, SIGNS AND OTHERS

Associating a body with somatic and kinesthetic sensations one constructs the particularly important "own body" under some originally primitive symbolic name, which, with the development of natural languages becomes "self".

In the wake of kinesthetic sensations one perceives particular bodies which get associated with one's "self" as its "signs", "expressions" or "manifestations".

Out of the multitude of his event-images one takes some, which, while lacking somatic and kinesthetic sensations, are otherwise homomorphic with one's own body and also, occasionally associated with signs. One collects them under "others" and considers their signs as expressions of their otherwise inaccessible but alleged sensations, images and symbols.

Besides direct sensations, signs provide additional input of the mentally constructed "reality", enlarging one's own experience, by that of the others.

SPACE

The idea of space is based on that of body defined above. Although the body is a secondary construct of mind, one coordinates to it unshakable intuition of continuous "physical existence" in spite of the fact that one perceives temporal alterations in it. We may distinguish with Poincare two kinds of alterations of an "object": changes of state and changes of position.

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The latter are alterations which one can reverse by arbitrary motions of his own body.

That there are bodies to which one can ascribe, within a certain sphere of perception, no alteration of state, but only alterations of position, has fundamental importance for the formation of the intuition of space. Let us call them "rigid". Given a percept encompassing two rigid bodies, some of its alterations can not be considered as changes of position of the whole, notwithstanding that this is the case for each one of the two constituents. This leads to the intuition of "change of relative position" of the two bodies and of their "relative position".

Moreover, among the relative positions, there is one of a specific kind which we designate as "Contact". Permanent contact of two bodies in three or more "points" makes them united as a quasi rigid compound body. It is permissible to say that the second body forms a (quasi rigid) continuation of the first body and may, in its turn, be continued quasi rigidly. The consequence of the imaginary quasi rigid continuation of a body B_0 is the intuition of the infinite continuum - the "space".

In Einstein's opinion, the mind's faculty of putting every body situated in any arbitrary manner into contact with the quasi rigid continuation of a chosen body of relation B_0 is the basis of our intuition of space. In pre-scientific thinking, the solid earth's crust plays the role of B_0 . The very name geometry indicates that the idea of space is mentally connected with the earth considered as the relation body.

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We shall find the intuition of space founded by rigid bodies at the base of Einstein's Covering Principle which requires physical distance to be measured, also in mental experiments, with physical rods complying with physical rules, such as the Lorentz Contraction. The Covering Principle underlies directly or indirectly the entire Extended Relativity. For the first time in the history of science an ontological principle is directly incorporated in mathematical formulation of physical theorems.

Continuous space, its primacy and the discrete covering measurement rods are aspects of the fundamental Polarity Continuum/Discreteness (CD) defined in "TIME, AWARENESS AND EVENTS" as the elementary structure of human Universe.

In mathematical terms geometry symbolizes the basic intuitive image of continuous space and arithmetic - its discrete covering measurements. The ultimate foundation of mathematics is the continuum. Discrete concepts starting with that of "number" are founded in continuum and symbolize its covering measurements. Shortly, arithmetic is founded in geometry.

We shall discuss it in more detail in "FOUNDATIONS OF MATHEMATICS".

In "SET THEORY" we shall show that its failure to define during 100 years the very concept of "set" and to ascent from discrete to continuous is due to the perverted inversion of the natural order and to founding mathematics in the discrete.

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SPACE-TIME and GENERALIZED COVERING PRINCIPLE

We have introduced in "TIME, AWARENESS AND EVENTS" the eventtual time as indications or ticks of a "clock," i.e. as recurrences of a periodical event.

Clocks discretize intuitive time as "physical rods" discretize intuitive space, which allows to formulate the Generalized Covering Principle:

EVENTS DISCRETIZE INTUITIVE TIME AND SPACE INTO EVENTTUAL PERIODS AND DISTANCES.

Associating each point of the intuitive space with a clock we construct intuitive Space-Time continuum accessible via rod/clock discretized eventtual bulks. We shall call this continuum "SPACE", capitalized in order to distinguish it from its "space" components.

FIELD

The above described SPACE is structured as the CD (Continuum/Discreteness) polarity, whose intuitive continuous term is unveiled and locally concretized by discrete percepts acting as covering rods and clocks.

This passive and static construct is complemented with the active, dynamic counterpart "Field" set up by such percepts as force, movement, inertia (resistance to force), action at distance (terrestrial, magnetic or electric attraction, the latter originally by amber - "electron" in Greek), sensing heat of remote sources, etc.

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Field and SPACE are conceptually represented by differential vector calculus. The fact that gravitational, electric etc. field appears only in presence of corresponding "masses", which, in turn exist only within their fields, leads to the principle that apparent "masses" are nothing else than places of non-disappearing divergency of their associated fields.

INTUITIVE CAUSALITY AND LOGIC

In "STRUCTURES OF MIND" we asserted that sensations trigger ordered "physical reality" of images and that mind's faculty of (re)cognition guides us through their labyrinth.

"Physical bodies" have been constructed by collecting some repeatedly occurring patterns of sensations into secondary images, apparently more "real" than their originations.

Similarly, one selects some pattern of event-images apparently always followed by another one and under names respectively "cause"/"effect" collects them into the secondary image under the symbolic name "causality".

Like in the case of "physical body", one attributes to this secondary construct "causality" the unshakable "physical reality" and certainty, unlike to its "cause/effect" instances. And, having constructed the "physical world" by populating it with "physical bodies", one orders it with the principal orderer "causality".

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A particular type of Reflection ("STRUCTURES OF MIND"), which we shall call "Inference", maps events ordered by causality into symbolic structures of expressions related "deductively" by Implication, shortly "ER structures". Inverse operation regresses "inductively" expressions to their territory of events.

Due to intuiting causality as unshakably "real", deduction appears as "necessary" or "certain".

Induction, on the contrary, retrieving the originating events of symbolic expressions, gets affected by their uncertainty and fuzziness (see "FUZZINESS" below).

Causality maps to the primary logical operator "implication". Other subordinated orderers order particular patterns of causes and effects. Let's mention a few, with their logical symbolic complements:

negation (not), conjunction (and), causal equivalence (or), "one of" selecting a unique event out of a cause pattern, becoming "exclusive or" for two-event patterns.

It has to be emphasized that there is an illimited, innumerable amount of secondary orderers symbolized as logical operators.

Common sense taking the illusory "reality" at its face value, considers the intuitive causality/logic as an evident rule of practical behavior, applying it instinctively to the day-to-day practice. One knows intuitively that hitting a nail with a hammer will drive it into the wall and that standing in the way of the oncoming bus will cause not a little misery.

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In the social praxis people tending to stand in the way of oncoming buses are isolated in lunatic asylums with others who cast similar doubts on causality and logic.

However, extended over intellection, the common sense unveils the prejudices it has gathered through the daily practice, and rigorous rationality starts by overcoming it. We shall present a rigorous view of causality in the chapter "CAUSALITY AND IMPLICATION".

The natural faculty of inferring, also called "Logical Reflection" or "Logic" is rather inefficient, due to mind's restricted capacity of simultaneously recalling numerous expressions and executing numerous operations. Humans attempt to enhance their limited natural capacities by creating tools. Thus hammer enhances the striking capacity of human hand and extrinsic logic enhances the limited capacity of human intrinsic, natural inference. Being an enhancement of the natural faculty, extrinsic logical systems may only be justified by extending and simulating the ER structures of the natural Logic, by accounting for the illimited number of logical operators as well as for the fuzziness of the induction.

Extrinsic purely deductive logical systems will be called "Theories" and complete, deductive-inductive ones – "Models".

Extrinsic ERN (Expression-Relation-Network) logic rigorously extending the ER structures of the natural Logic is presented in the chapter "ERN LOGIC".

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TRANSCENDENCY AND IMMANENCY

In "STRUCTURES OF MIND" we saw that "reality" defined as all what's experiential, is entirely mental and immanent, encompassed by sensations and by percepts of Imagery.

However, Sensorium maps Imagery as a map of some hypothetical territory - "Transcendency". And, Imagery appearing as an ordered reality, temptation arises to regress it to its transcendental territory and to posit thus called forth transcendency as the "real world out there". Yet, no matter how tenacious and persistent this temptation may be, the transcendental "reality" of regressed mental constructs is nothing, but a "transcendental illusion".

We saw above that one attributes to the secondary constructs, viz. "physical bodies" a more unshakable "reality" than to the percepts which gave rise to them and that finally, one constructs the "physical world" by populating it with them. We are now in position to precise it further:

One may give in to the temptation and fall prey to the transcendental illusion by regressing mental secondary constructs - the "physical bodies" to "real objects" of transcendency. To use the fashionable philosophical term, the transcendental illusion is tantamount to reification.

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Once reified, the transcendental "real object" maintains the illusory speculative reality independently of its originating percepts and sensations, as a "container" which may, but does not have to contain them, i.e. it functions as autonomous "thing in itself" aka "noumenon".

Contrariwise, the bodies of imagery are indissociable from their originating percepts and sensations, i.e. function as phenomena.

We may conclude:

IMMANENCY IF PHENOMENAL AND TRANSCENDENCY - NOUMENAL.

The transcendental illusion applies also to logic. The transcendental "world out there" being populated with noumenal "real objects", their interrelations and associations with "contained" sensations fall into the province of the reified, noumenal, absolute logic.

While the ER structures of the immanent logic represent the relative causal order of events, the transcendental logic posits absolute structures of transcendental "real objects" related by the reified "deterministic" causality.

FUZZINESS

All imagery constructs are affected by fuzziness stemming from two principal sources:

1. Time approximation by discrete tick intervals of involved clocks ("TIME, AWARENESS AND EVENTS").

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2. Arbitrariness of bodies constructed by collecting similar patterns of sensations. It affects, of course, the bodies themselves, via bodies - the space, and, together with time - the space-time.

The general, ontological fuzziness of the physical reality should not be confused with particular uncertainty cases stemming from detectors affecting the detected, from statistic procedures, or from singularity areas of continua.

DISCLAIMER

The Natural Model described in the present chapter represents our view - based upon that of Einstein - of mental processes constructing the "Physical Reality", such as underlies the physical theories. It's a purely factual description, in no way attempting to judge the Natural Model, which would be tantamount to judging gravity. The Natural Model is not based upon any established philosophical system and eventual similitude with some of them would be coincidental.