Referon Analysis (pReference of Reference)

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Abstract
Most models of mathematics and physics are incomplete, because they lack a description of their Basis: their system of Reference. The reference system specifies the nature of our involvement in the observation, which determines the singularities of the system, thus the potentials and limitations of any specific model. As each model reflects our nature, the lack of understanding of the nature of our involvement – in our understanding – backfires in unforeseen side-effects of that model. The problems caused to Nature, by contemporary science, is the result of the ignoring of the role of our involvement in nature, and the nature of our involvement in the models we make. By making the nature of the reference system that we prefer to use explicit, such problems can be resolved and prevented.
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1 Introduction

A brief reflection on some background concepts is in place. Mathematics, Physics and Science in general, are structured systems of beliefs, based on an implied preference of reference. The various forms of science are determined by their preferential systems of reference. Classical Science, e.g., opted for a reference to a determined (Euclidean/Cartesian) point of preference (that of an Outsider Observer); yet found that in practice this did not work well enough: it led to conflicts in realisation. In its work to remedy this situation science discovered that it needed to use other 'frames' of reference: ones which were not so determined/deterministic/closed, but more open-ended, more transformable, even transparent, Although Science changed its fundamental system of pReference, in going through the transitions of Classical to Relativistic to Probabilistic to Field models; it did not acknowledge that in fact it systematically changed its most fundamental system of beliefs; of its perception of reality. Nor did it realise that the changes in science were not changes of reality, but changes of realisation. It did not realise either that every form of science is anchored in consciousness: in the structure and architecture of our beliefs. This can be explicitly described in terms of relationships between Unit Systems of Reference (Referon Analysis). However, this cannot be described in terms of the reference systems themselves. This is due to limitations, not of Science, but at the level of Languaging. It requires an understanding of the nature of pReference systems, why we choose them, why we define them, and how we create them. This is intimately connected to the relationship between personal beliefs and cultural consensus. Both are patterns of reflexes, systems of local embedding, of which

reference systems too are part. Science is but one of its forms of expression. Art, Commerce and Mysticism use other implied frames of reference, leading to different forms of participation *in*, thus different realisation *of*, 'Reality'. As long as the systems of (p)reference, and their limitations, are not studied (in/by science), their relationships, and warp on reality, cannot be realised either. Because reference systems cannot be described in (objective) terms of a reference system, due to these limitations in language, it is necessary to realise them as (subjective) changes in involvement. Changes in system of pReference can be realised at experiential levels, as changes of our state of mind, in which we always have a choice, which one to use for which goal. This means that fundamentally they cannot be used to support Reality, but only our Realisation; this places our (use of) consciousness at the core of science.

The Society relies to a great extent on Science, as a means to validate what "reality" is like, or not (Schrödinger, 1944). Science to a great extent relies on Physics, as a main tool for ascertaining what is 'real', or not (Davidson, 1989). Physics again relies on Mathematics as a main means for ascertaining its realisations (Kaku, 1995). However, Mathematics has no real means to establish what realisations are real, or not. Consensus (Maturana & Varela, 1980) is an often used (implicit) methodology for affirming the realisations of mathematics, yet there is no founded concept of the realisation process itself, and its foundations. As a result, in our use of models and theories (in Mathematics, Physics and Science) the barrier between Reality and Realisation (known as "the Veil of Maya" (Bruyere, 1994)) can become so much a reflection of our ways of observation, so seemingly 'self-evident', that their difference is no longer perceived. The model is held to be real - and the basis of reality - instead of the other way around. However, 'the map is never the territory', and all our realisations are not real, no matter how convincing our models and theories may appear to us (Bandler & Grinder, 1975). What is lacking, is a means to know how real our realisations really are. This requires a more basic approach than a mere use of our reference systems as a means to describe *what* we see; they need also describe *how* we perceive (O#o, 1999c). It means that the science, physics and mathematics of making models needs to include the psychology of our use (and especially design) of models (Maturana & Varela, 1980, O#o, 2001d). This becomes most explicit in the design of mathematical formulae (as used in physics, as used by science, as used by society); but most fundamentally in the design of these models themselves (O#o, 1989). This is seen most explicitly in the formulation of the Systems of Reference, especially in the design of Unit Systems of Reference: those fundamental formulations on which the basic operations of mathematics are based.

Unit Systems of Reference lie at the basis of the operations of mathematics, thus its use in physics, and the formulations of science. Unit Systems of Reference determine the course of society, as the 'atoms' of our ways of formulation (thus, through our models, our realisations). Yet, Unit Systems of Reference are meaningless, if there is no true realisation of the how-&-why of their creation; and what determines 'a Unit'. (Any unit simultaneously defies a quantity (a Unit), and a quality (as based on our relationship with respect to Unity (Baszó, 1996). These qualitative relationships, reflective of our own involvement, are habitually ignored in classical science.) The formulation of Unit Reference Systems must not only define their structure, and use, but

also the reason for their formulation, and in which way (and to which extent) they reflect our own functioning.

This aspect is consistently lacking in science: the description of the Origin of Unit Reference Systems themselves. Without such basis, no matter how solid the lines of reasoning used in mathematics, physics, and science: it is no more than a 'castle floating in the air': unfounded. It is necessary to define in which way the Unit Reference Systems are reflective of our realisations. This means that our mental mathematical modelling must be traced back to, and founded in, our own use of mind (O#o, 2001d). The relationship between our subjective realisations, and our objective realisation (as communicated via language) *must* be established, and made explicit, in the definitions of our Unit Reference Systems themselves (O#o, 1999c). It is this notion that forms the basis of Referon Analysis, of which this paper presents the underlying notions. "Referon Analysis" is the rigorous and fundamental (re)consideration of all the basic reference systems on which mathematics (thus physics, thus science) are based, with inclusion of our own mode of involvement (O#o, 2000b).

The study of Referon Analysis started many years ago, in 1974, when (while studying in engineering school) it became clear that the mathematics used in engineering could to some extent describe the transformations between Reference Systems, but it could not account for the emergence of Reference Systems. It did not address the psycho-mechanics of the need, selection and creation of the reference system itself (Langhaar, 1951). It also ignored the relevance of our own involvement in designing, modifying and maintaining Reference Systems (de Kerckhove, 1992). Later (while in medical school) the noted omission in this basis of modelling became more poignant, when it was seen that medical models are being 'compared' to each other, although if they do not share the same perspective, nor the same logico-philosophical basis (Gerber, 1988). This text offers insight into the principles of Referon Analysis, created for the purpose of relating reference systems of different kinds. What is described here at a rather fundamental level, has quite practical applications, such as in the above mentioned field of medicine, to show why different forms of medicine can *not* be compared, although they are related to each other.

What is described here as a series of fundamental mathematical relationships of perspective, is in fact a reflection of patterns of thinking (Spencer-Brown, 1973), within protocols of communication (van Schooneveld, 1978). These are always embedded within socio-cultural systems of understanding/communication. The formulation of Systems of Reference, are always expressions of a Systematic Preference, and needs to be understood in that (political) sense: why is the specific System of pReference used; what is its utilitarian value, what does it make possible, and what does it deny (i.e.: what is its Blind Spot). The relating of different perceptions takes place, in mathematics and physics, by taking reference to such systems of pReference (bias). Even our perception of 'Reality' is based on the same principle (Winter, 1992). Referon Analysis is designed to address the most fundamental basics involved. This evidently gives it many practical applications. In comparing different models it is not enough to compare the systems of reference; it is necessary also to specify why that system of pReference is used (O#o, 2000b), what it enables to see, and what it makes impossible to perceive (O#o, 1989).

This applies not just to unique realisations of any individual, but also to collective consensus constructs (such as 'Reality", or "Culture"). Reality is a (culturally conditioned) belief. This can be realised by noticing that different cultures often don't share the same sense of Reality. (In fact, most, if not all, wars are based on clashes of belief system, and the corresponding mental fixations, by which realisations become unshareable with others.)

Systems of reference are systems of preference. The seeming steady, or even invariant, states of 'Reality' reflect mental modes of fixation, or entrainment. Our perception of reality is a consequence of our Realisation (O#o, 1999c). Although this is an internal mental process/state, our descriptions of reality are expressions of the same, and the dynamics of our 'intractable mental processes' (and their state transformations) can not be explicitly seen, and only indirectly experienced, the models of science, like Wilson Cloud Chambers, reflect these internal mental processes, and the changes of state involved (O#o, 2001d). The states and dynamics of our mind, individually and collectively, is mapped in the equations and systems of science. The traces and signs used in science can thus be used as spoor, to track our changes of state of mind: our mental functioning. This can be seen most clearly in what is presented here: Referon Analysis, the study of the relationship and origin of the systems of reference we use. As they are our mental tools, and fundamental expressions of our deep states of mind, and the processes by which they were formed, the changes and relationships between systems of reference show how we are individually and collectively linked in the tapestry of interweaving lines of thought, in the fabric of the languaging by which we communicate with each other. The systems of reference are systems of preference; for clear and definite reasons. It helps to know how we create systems of reference: by this we can also understand why, individually, thus collectively, we regard 'reality' as we do, and interact with each other as we do(n't).

2 Analysis of Systems of Reference

Whatever model, hypothesis, theory or reality we consider: it is always based on assumptions. There are implied assumptions as to the meaning we give to what we perceive. There are implied assumptions that what we perceive is actually the same for all people involved. There are implied assumptions that our perceptions are based on the same states and processes of mind. And there are assumptions that what it perceived, and how it is perceived, reflects universal principles an natural laws. These are merely assumptions, and none of these may become transparent, if they are not made explicit. For that reason, the hidden and implied assumptions, the values and meanings to which they refer, the relevance and consequences they are taken to stand for, must be made explicit (O#o, 1999c). This is not easily done in common speech, where the use of language automatically leads to circularity: the use of language to explain the use of language. It is more suitable in mathematics, a language which contains the structure and logic for self-reference: its use and its meaning can thereby be discerned, which helps to make the meanings clear (O#o, 2001d). This again can be used to make the assumptions by which we function explicit.

2.1 Reference Systems

The basis of mathematics (and physics, and all of science) lies in the Reference Systems that are used. Any statement, or observation, is always in respect to something, thus relative. This is in part by the nature of languaging, and in part based on properties of observation (Bandler & Grinder, 1975). Languaging is an interfacing process, by which people are linked through the exchange of code. Those codes are encrypted (Winter, 1992), generalised, abstracted interactions (van Schooneveld, 1978) with the environment (including our perceptions). The encoding and decoding are acquired, trained, social traits (de Kerckhove, 1992). The codes differ per culture; but all are based on our innate capacities and properties of perception and expression. As Maturana & Varela (1980) pointed out: Languaging is a based on the attribution of meaning to elements in our environment; combined with a social operation of the creation of consensus (which implies territorial interactions). It is relevant to realise that the attributed meanings are meanings 'out of context': the object is chosen to represent something that it is *not* (O#o, 2001d). This included the principle of Alienation {John Wood, 2001, personal communication}. These general properties of languaging apply also to all elements on which Languaging is based. This includes the choice, and creation, of the basis of the language system itself (O#o, 2000b): the implied set of values and meanings as projected onto our environment (and each other), as seen in the reference systems that we use. Understanding the origin and role of those reference systems is essential: they form the foundation of all languaging that takes place. They form the manifest singularities of our all our systems of reference, and reverence; the 'turning points' by which what we think (internally) and communicate (externally) are related (Pribram, 1994). As the transition between internal and external, in communicating, implies: this involves the concept of System Inversion. Singularities are the pivot points, sites, where those inversions can take place in a regulated way; and the integrity of the system maintained. Reference Systems perform that role in all our communications. The construct of reference systems can be studied by the same principles as by which reference systems are defined, and created. This calls for an understanding of the processes and principles of Identification, by which Normalisation of Reference can take place. This process, by which *Reference* can reflect *Preference* and become a basis of *Reverence*, can only be resolved by understanding the origin and nature of Reference Systems themselves. This notion is studied here in a more abstract and generalised sense: as the category of Reference Systems (as expression of our communicational preference Systems), as describable by using the mathematical notions normally used for this purpose. This makes it possible to regard the mechanics of our own involvement, in the reality we live, in terms of the operation of our realisations; as made explicit by regarding unit(y) Reference Systems, and the way they relate. In parallel to the use of 'proton' and 'electron' as units of charge, the term "Referon" is introduced here to denote a unit of Reference. Ideally, this will always relate to Unity Reference: the basis of integrating our perception of our reality/realisation as a whole.

There are many forms of Reference Systems; they are all related to, and expressions of, our choice of involvement. (Kubis & Macey, 1995) By the reference systems we use, we will perceive reality accordingly: Reference Systems, as Preference Systems, become Reverence Systems (when Normalised, i.e. made 'independent' of our choice of involvement)). (Cf. reference system as mental objective, the equivalent of eye glasses to change the focus of our eyes.) As a result we can perceive Objects, Processes, Transformations or Creation, depending on our choice of Involvement (O#o, 2000b): by being Outsider, Reactor, Interactor or Creator of our experience. Classical Science, erroneously, assumed the first 'role'; as later, respectively, the Relativistic, Probabilistic and Field Theories of science showed, in exploring the other alternatives on the experience of involvement. These changes of involvement are encoded not only in the structure of our language (van Schooneveld, 1978), but also in the more condensed form of our communications/formulations, as expressed in Mathematics, as seen e.g. in Physics. The following will briefly illustrate this by showing the properties and effects of the choice of different forms of frames of Reference, in regarding material systems/relationships.

An aside: The Reference Systems are always (inter)related (with/)to the System Singularity Set: the constellation of interconnected system singularities by which the system can appear as if independent, and autonomous, while at the same time fully embedded in its context. The System Singularity Set, determinant for the continued maintenance of the system state dynamics, operates by the principle of Total System Inversion, which will be separately described at later time[1]. It involves the attuned phase integration dynamics, which in living bodies are known as the meridians (trajectories of dynamic relay of phase information (Tiller, 1997)). The pattern of nodes of the Singularity Set is known as a constellation. The flow of phase information forms an integral system (a virtual singularity) through which the system is able to phase invert, continuously, yet maintain its operational integrity (health) (Kervran, 1976). The cycle of the Meridian Clock, in Traditional Chinese Medicine (Gerber, 1988), is example for this; the interactive attunement of our body organs is another: together they make it possible for material to pass into and through our body system; by operating the principle off Total System Inversion (to be described later).

2.1.1 Invariant; Euler

The Euler Reference system regards changes with respect to a fixed, invariant, unchanging or inert frame of reference. It will be clear that such frames of reference can exist only in a materialised view of reality, i.e. when the dynamics of cosmology/creations are regarded from a perspective of material condensation (Big Bang $\Rightarrow$ Gas Clouds $\Rightarrow$ Fluid Stars $\Rightarrow$ Solidified Planets). It will be evident also that the perspective, or comparison to Invariance, is because variance is what is observed.

[1] O#o, "Total System Inversion" (Relating Inverted Realities), in preparation

2.1.2 Variant: Lagrange

An alternative form of observation, named after Lagrange, is used for observing flows: motion is compared to motion, and a moving system of reference is the Norm by/against which observations are made. It regards the changes of energy states, with respect to the process dynamics, which are used as norm and reference for regarding how their changes take place.

2.1.3 Transformative: Thom

The observation of transformation requires the ability to discern different states of being, beyond the material manifestations; this requires a capacity for system transcendence, thus the ability to relate forms to the unformed. There are very few usable reference systems for this; the most suited and known is that of René Thom: it bases itself on the 'leading edge of the waves of change', called cusps, where our perception of reality changes and different forms/modes of realisation are required.

2.1.4 Creational: Vedanta

The perception of creation requires the correlating of different states (and phases) of Reality; it requires an anchoring on our realisation. Such frames of reference can only be subjective, based only on our own realisations. They require an insight and understanding in the nature an origin or our realisations: how and why they take place. Referon Analysis is designed as a means to reflect on these fundamental internal processes, by regarding the basis of our external communications: Reference Systems in their most elementary forms: how they relate to each other, and thus to us, by the way we create and use them. The most well developed (and well known) systems of consciousness reference are those of the 'religions'; for which the Vedanta is an example (Bhagavad Gheeta). (It offers clear metaphors for our shifts in mental/perceptional/cognitive/realisation states.)

2.2 Preference Systems

The Reference Systems of Euler, Lagrance, Thom and of Consciousness refer to respectively a Normation (and normalisation) of Space, Time, Energy and Consciousness as norm/basis for perception {Young, 1976; Bazsó, 1996}. In taking reference, they also specify a preference: what they look *at* is not what they look *by*: to observe Change (Time), the Euler-System takes preference to Space, a linear fixed construct. In order to understand the modulations of (wave/flow) energies, the Lagrange-system takes preference to regular Processes. In order to be able to identify changes of Logic, the Thom-System takes preference to the changes of organisation with respect to the possible Energy States. Likewise, we can only discern changes of Consciousness, by preference to alternative forms of Realisation. In all cases respective relational Relativity is the essence. Every System of Reference is a measure against which we compare our perceptions: they function al mental, 'magical', mirrors. They enable us to reflect upon ourselves. Systems of *Reference* that are used indiscriminately (without the realisation of the relative role, and bias, they represent in their use

(selection/creation)), lose their meaning as system of Reference. Because of their identification with our own state they become systems of *Preference*. If the identification with our own state is no longer taken into account (or 'no longer allowed'), they become systems of *Reverence*. Like instruments that we us, they no longer serve us, but we become addicted to them. This will lead to compensational behaviour by which such systems of Reverence/Preference/Reference are used and put in place with, in preference, or with exclusion of other systems of reference. (In health care this decay of system stability is known as the cascade of loss of health: Health => Adaptation => Compensation => Decompensation.) As the above examples show (O#o, 1999c), a system of reference is always relative to our perception, thus relative to even itself: the Euler, Lagange, Thom and Vedanta are significant because they all address the *same* reality/realisation: our experience in interaction with the environment in which we exist. (That too is a relative state change). Together they span the full cycle of states, processes, transformation and creation, which reflects the principle of Total System Inversion, underlying the state/phase change in our interaction with the environment, in which we are simultaneously separate, connected, interlinked and totally involved. By using the systems of preference together, in conjunction, and by seeing how they supplement and complement each other, it is possible to achieve integration of our experience (enlightenment). This 4-element cycle of the boundary transition, is the essence of the relationship between reference systems, because it is the essence of our relationship to our context.

2.3 Belief Systems

Reference systems are anchor points in conversations; pivot points in interactions. The value of the reference system lies in their explication of, with respect to, these connective relationships. Their specific relative connections can thereby be defined, as indicated by the cipher *one*, for unit reference, which is an operation of normalisation of the interaction. On this basis it is yet again possible to specify any individual degree of involvement, usually denoted by e.g. the indicator x, N, Φ, or ∞, depending in the form or mode of involvement (O#o, 1997). The descriptive system is thus both quantitative and qualitative. Quantitative to the degree that it can be identified with; for which the number 1 is the habitual form of notation. It is qualitative to the degree that it specifies our mode of involvement, beyond our scope of definition; as indicated by the number 0 (the singularity of the system. Depending on the form of relationship (or interaction), the form of the axial lines, representing our forms of involvement, will differ: 1) linear, if no second order relationships are taken into account, 2) curved or vectorial if this is the case. 3) Bicurved, cylindric, helical or cyclic if third order variations form part of the form of involvement, and 4) spiral (or Transcendental) if fourth order relationship are also considered. (O#o, 1999d). This reflects the explicitation of the degrees of freedom, specified in/by the interaction. If these higher order relationships, thus modes of interwovenness, is taken for granted, then the reference systems fail to allow explication of the way the observer is involved in the observation. The first order system of Reference thereby changes to a second order system with pReference, into a

third order system of Reverence, and finally a fourth order system of Blind Bias. These systems of response, again, all interact, in our states of being, and also in our ways of communication. Basically, this is a reflection of our abilities to interact and respond to our environment (by operating the system singularity set on which we are based). Inversely seen, it reflects the inertial patterns in our processes of communication, as expressed by our beliefs. Beliefs are basically 'made up of the same material' as all our experiences in life. They are valued differently because the general meaning they are given, beyond of the scope of the symbol by which the belief/experience is represented. "Reality" is one of the inertial undefined valued belief, which cultural collective consensus conditions and share.

2.4 Reflex Systems

This is the same set of relationship as seen in the transition of physical states, from plasma, to gas to fluid to solid. This can also be expressed in a transition from creativity, through correspondence, reactivity to inertia. These are the operant modes of vital response, as found in respectively sapient creatures, reflex operated animals, the vegetative being of plants, and the resonance in minerals. The dynamic organisation of these internal degrees of freedom, which moderate and modulate our interactions in our environment, operate in part at the level of our awareness, and conscious, cognitive, interactions. The relationships involved can be described as if they are properties of our surrounding nature; however, our experience of solid, liquid, gas or plasma, is always with respect to our own state of being, and phase state dynamics. {Arthur M Young, Maps of the mind}, ... In that sense our conscious cognitive aware mental capacities are simply modulations within modulations of the principles on which our reflexes are based. (Cellular reflexes determining organ reflexes, conditioning personal reflexes, co-creating the patterns of behaviour of humanity.) This could be interpreted as 'consciousness is but an epi-phenomenoun of interacting reflexes'; conversely it can also be said that reflexes are conditions mode of consciousness (interaction in context). This second interpretation makes it possible to understand more properties of consciousness, in more encompassing ways. The notion and formulation of Referon Analysis, helps to make this notion more clear.

3 Creation Consciousness

Reference systems are pivot points of our interactions, and communications; and as a result also points of specification as to how we relate to ourselves. Although languaging is an important cultural asset, it is not the basis of human being and cognition. As any baby's development shows: our ability to learn precedes our capacity to know. And our internal functioning is the basis of the ways in which we interact. Although culture, and languaging, takes reference in symbols and language (the elements of communication that we share and exchange), communing is still based on the collective experience of individual uniqueness. Referon Analysis can be used to make this more clear: it is not as important that we can select a shared reference system, and agree to its use. It is much

more important that we can *create* systems of reference, to reflect our (maintained) mode of involvement; about which we commune(icate) with others. The creation, selection, conditioning, and maintenance of any system of reference is more important than most people realise. They form the pivots of what we can communicate, thus can agree upon. By the selection of the reference system we determine and define the reality which we interactively create, as much as the selection of dimensional parameters, in dimensional analysis, determines the region, scope, boundary definitions and break-off conditions of the dimensional realm that is discerned (Langhaar, 1951). The principles involved are, in fact, the same (O#o, 2001d). The need for explicating our creation, choice, conditioning and consensus of reference systems needs to be made explicit in all aspects of our live; as they are the foundations for relating between different respective modes of involvement.

3.1 Science as Tool for Conditioning Consensus

One of the cultural frames of reference, most identified with that of objectification of reality (regarding the object related aspect of our realisation) is in the social setting of Science. The most determinant evaluation factors are those of verity and reliability.

3.2 Art as Alternatives in Perspective

For the more process related, participational experience of our reality realisation, the Arts are the collective cultural collective reference. Here one of the more valued criteria is that of esteem, and presentability.

3.3 Trade as Exchange of Values

The cultural involvement with energy transformation, is most noticeable in the social stratum of Trade. Status and wealth are held to be the more valued criteria of performance in this approach.

3.4 Mysticism as Realisation of Reality

The cultural relevance of individual experience, and integrity of personal involvement, is commonly known as Mysticism. Realisation and integrity are the prime parameters of appraisal.

Each form of involvement pertains to a different formulation of our Reference systems (which are the basis of the models we define). The models and formulations as used in Science, are therein but part of a much larger (social/cultural) perspective. The view on Reference Systems, too, is to be regarded in that much more encompassing sense, and needs to include other modalities of human communication and involvement. Reference Systems can not be held to be a prerogative of only science; history shows that the formulations of science most often have their origins outside of science. This requires a perspective transcending that of science; this can be obtained in practical terms by complementing the formulations (of Reference Systems) by science with those

of art, trade and mysticism. (Although Science, Art, Trade and Mysticism have come to be regarded as mutually exclusive, they are not. Together they represent respectively the outsider's, reactor's, interactor's, and creator's appreciation of reality, or rather: our realisation of the experience of life). They are each simply different relative respective preferential prevalent frames of Reference, by which a preference is given to respectively the object, process, transformative, and experiential perspective. The difference is also seen in the terminology most used for describing the result of one's experience, via these respective aspects on realisation. In Science, where the participant is held to be an outsider', it is customary to speak of Reality, as an objectified Thing, in *Existence*. In the Arts, where participation is the predominant form of involvement, the accent is on *Experience*. In Trade, where interactivity is the predominant perspective on involvement, it is *Expression*. In Mysticism, where the subjective integral involvement can be held to stand central, it is *Realisation*. Each of these four aspects can be held to be diametrically opposite (in a 4D set); yet they are all equally valid perspectives, and equally usable as frames of reference for living. In our body it can be seen that all four forms play equal roles in our existence. It is the preservation of the integral relationship between them, that appears to be essential to our experience of life.

4 Boundary Transitions

Boundary definitions are probably the most fundamental level of description we can reach; in the double sense of the word: it is limited by our scope of grasping, by what we are, in what we can do. (We cannot let ourselves outside of the descriptions we make.) The boundary conditions are encountered most explicitly in the set of System Singularities: the kernel processes by which the system transformations are defined, by which the system can turn inside out (and, by implication, back into itself. O#o, 2001d). The core concept involved is that of Total System Inversion: where the Part relates to the Whole. This can be explicitly described as the relationship between the Closed and Open Systems.

4.1 Closed Systems

The perspective of a Closed System, regards objects: stable elements, invariance and inertia are held to be valid modes of observation. Closure implies disconnectedness or isolation; this form of reference, thus description, is not able to determine the relationship between the observed object and its environment; this applies to the spatial (existential), temporal (ontological), energetic (epistemologic) and informational (cosmologic) modes of relating.

4.2 Open Closed Systems

Closed systems exist because of their internal dynamics; those dynamical processes, and process dynamics, are linked to environmental processes; depending on the phase of energification, those linking processes will be active (strong), patent (weak), latent

(disperse), or passive (indefinable). (This is the basis of the different forces of physics, which are in fact one and the same, from a 4D integral perspective.)

4.3 Closed-Open Systems

Constellations of closed systems, in interaction, are both closed and open: they are identifiable; while at the same time observable as interacting processes. The dynamics of their interactions, thus relationships, may be variable even while the components involved are not. This requires a different perspective for interpretation than that used for Closed or Open-Closed ("semi-conducting") systems.

4.4 Open Systems

Open Systems are defined by their absence of definition. Yet, their existence may be evident (albeit sometimes by its absence). Even though the Open System is not definite, nor definable, its presence is immanent: it is the system in which the system of observation is embedded (and in/by which that system of observation is defined). The properties of the open system are thus immanent in the (open-) closed (-open) systems, which provide emergent expressions of the open system properties.

The difference between a Closed, Open-Closed, Closed-Open and Open System, is only one of perception; an emergence or immergence of perspective. From a cosmological perspective, the Closed System is a subsystem of the |Open System, i.e. all that is manifest and defined has undefined non-manifest origins. The Open System is quite elaborately described by the religions of all cultures, albeit that the terminology for its descriptions if often left much more implicit than is now possibly by the 4D inference method (4D D Logic; O#o, 1982) that is possible by the use of Systems Theory formulations. Yet, the concepts and principles are the same. By making use of the internal (4D) Logic of transcendental systems analysis (O#o, 1995) it is possible to show the relationship between the different forms of formulation (of Mysticism/Religions, Trade/Exchange Operations, Art/Variational Analysis, and Science/Definitions).

5 Referon Analysis

Referon Analysis is the most fundamental description of our realisation of reality. It deals with the process of observation itself, as it is expressed in the formulation of System Transcendence: the relationship of the Part to the Whole. This applies also to the origins of science, the origins of mathematics, and the origins of Languaging. Whatever system of reference we use: it is meaningless if we cannot explain how it came to exists and for what purposes it was made. This gives Referon Analysis the same double meaning as is characteristic for all our use of languages: we need to understand how it relates to us, and how it relates to the perspectives of others, in communicating about our realisations of reality.

5.1 Mathematics

From the perspective of social communications, Mathematics is but one of many forms of language used to communicate ideas between people. The ideas always immerge within a person, as result to triggered responses to the experience in/of the environment, based on the natural body system response capacities. (O#o, 2001d, 1997c). Mathematics, as any language, has no other value than what is attributed to it: its meaning lies always in its interpretation by the communicants, sharing their respective perspectives. (idea(l)s). Mathematics is an abstracted form of languaging: it does not require any specific reference to physical reality for its (mental) operations; even though it is based on our thinking processes and communication protocols as originating in/from/by our interaction, with our environment and each other. Its most specific relevance lies in its implied aim to verify and attain clarity in what is expressed in the specific form of languaging (Maturana & Varela, 1980) that it represents, and the way it helps hone our perception. In Referon Analysis, this involves the description of the system in itself. (The traditional term, in the classic Greek descriptions and in Alchemy, is that of the Earth Element: the definite defined system state. I.e., there are no determinable internal degrees of freedom.)

5.2 Physics

Whereas the mental operations of Mathematics do not require reference to our environment (and thus 'represents a (mental) reality of its own'), Physics derives its meaning from the relevance of its descriptions of our environment (and, in more limited sense, ourselves). This means that Physics is more geared towards our processes of perception (whereas mathematics is more a reflection of the principles of mentations). >From the perspective of Referon Analysis, this involves the description of the system definition: its contact with its context. (In Alchemy, the traditional corresponding term is the "Water Element". This corresponds with one internal degree of freedom.)

5.3 Languaging

Languaging, a more encompassing concept than Physics, and Mathematics, has relevance in a social context. Its validity is determined by the social role and relevance of the communicants, as participants in a (shared) context. These interactions are always interactive, thus system transcending. Because the communication is 'valid' only as long as the systems are coupled, this corresponds with a Closed-Open System state. A dual description is implied: each communicant expresses its own system state, *and* its reflection on/off the interaction(s) of which it forms part. (An extra degree of freedom needs to be accounted for in the description; which Alchemy traditionally expressed as the "Air Element". This reflects a system with two internal degrees of freedom.)

5.4 Consciousness

More encompassing still than Languaging (Physics, and Mathematics) is the principle of consciousness: the co-ordinate internal responses, within a person, in reflection to experiences win/in an environment. The principles of process entrainment, process interference patterns, and their harmonics evidently play a role herein, and Consciousness involves many more processes and interactions than we are consciously aware of. This, again, reflects the relationship between the Open System, the Closed-Open System, the Open-Closed System and the Closed System modes of perspective. The relationships between these are determined by the patterns of phase coherence by which the boundary/filter/definition of the system with respect to its context is defined. The phase relationships, and phase transitions involved, are all part of the same integral complex (O#o, 1998a, 1999c). In terms of Referon Analysis, this system has three internal degrees of freedom, sufficient for it to reflect back upon itself, without a need for closure. (This is traditionally expressed as the Element Fire, essential for Creation.)

6 Conclusion

The determinability of any described system needs to be accounted for in its description. As our own involvement forms essential part in the process of describing, this calls for a precisioning of not only our modality of involvement, but also of our chosen mode of perception (or 'attachment'). This requires and explicit formulation of our preference of reference, The procedure for doing this, introduced in this paper, is "Referon Analysis". It describes the relationships between unit systems of reference, and the ways in which they can be described, as result of our own perception, as determined by our own degree of involvement with/in what is described (i.e. communicated).

Deterministic reference systems are terminal; they are finite, yet often assumed to be infinite in the validity they imply. This inverse-duality is a consequence of the ignoring of the properties of the limitation (singularities) of the reference system itself. The reference systems and axioms on which they are founded cannot be explicitly described; yet implicitly understood. They are based on the mental state within the scientist, and his/her embedding in the culture, and its conditioning (which is an implied territorial survival constraint). The preferences for reference systems are in part personal, and in part cultural; personal to the extent that the person realises his or her own realisations. Cultural to the extent that languaging (including protocols for acceptable behaviour) allow for the expression of the personal realisation. Between these double-binds the experience of reality is defined. Imposing that the languageable cultural condition apply to individual realisation (as science seems to dogmatically impose) belies that Consensus Creation is a cultural interaction; science is created by scientists; the form science/validation/reality/realisation takes is the consequence of the involvement, participation, expression of the individual scientists. The imposition of ritualised canons and forms is (by the definitions of science) not scientific and dogmatic; it is a behaviour

reminiscent of the churches in the past. The recursion to established patterns, as in reflexes, can prove to be a one-way trap, if the bases of the instrument are no longer understood. Ultimately all frames of (p)reference that are used are expression of personal/cultural languaging and expressions of reality realisation. Referon Analysis makes this explicit, and thereby offers a tool to see that Science (as are Art, Trade and Mysticism) is a mode of perception; and limited by the assumptions implied. This is an essential step to be able to use science, evaluate its results, and reflect on the meaning with respect to our personal life.

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