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REVOLUTION FOR EVOLUTION BY CLOSING TO THE INVERSE

Tudor NICULIU[1]

Acest eseu este destinat tuturot căutătorilor de frumusețe, adevăr, sau bine–de la tinerii educați atraşi de spirit, minte ori natura, la cei tineri prin talent, competență, sau performanță–deci îşi permite metafora drept abstracție, citate inspirate ca punți spre adevăr, sau comparații corespunzătoare vieții libere.

Simularea conştiinței cere transcederea de la calculabilitate la simulabilitate. E necesar un efort intensiv asupra unei cercetări extensive pentru a integra cunoaştere matematică şi fizică esențială spre scopuri filosofice. Un mod de a începe e simularea ierarhică. Structuri ierarhice interdependente coexistă spre a structura universul modelelor pentru sisteme complexe, e.g. hard-soft. Ele aparțin tipurilor de ierarhii, definite de: abstracția de simulare, modularizare, simbolizare, clasificare şi abstracția de cunoaştere. Aplicând principiul divide et impera et intellige tipurilor de ierarhii revelează importanța lor pentru inteligența artificială. Puterea de abstracție e masura reală pentru mintea umană. Transformarea abstracției în construcție comprehensivă ar putea fi scopul omului, unicul Dzeu pentru diferite culturi ale oamenilor liberi. Calea spre libertate e prin înțelegerea necesității. Trebuie să-i amintim conştiinței să ne reintegreze mintea cu spiritul, şi să reamintească societății că trebuie să asiste omul între oameni.

This essay is for all searcher for beauty, truth, or good–from educated youth attracted by spirit, mind or nature, to those young by talent, competence or performance–therefore allowing metaphor as abstraction, inspired quotations as bridges toward truth, or comparing corresponding to free life.

Conscience simulation demands to transcend from computability to simulability. Therefore, an intensive effort on extensive research to integrate essential mathematical and physical knowledge guided by philosophical goals is necessary. A way to begin is hierarchic simulation. Coexistent interdependent hierarchies structure the universe of models for complex systems, e.g., hardware - software ones. They belong to different hierarchy types, defined by simulation abstraction levels, autonomous modules, classes, symbols, and knowledge abstractions. Applying divide et impera et intellige to hierarchy types reveals their importance for intelligent simulation. The power of abstraction is the real measure for the human mind. Turning the abstraction into comprehensive construction could be the aim of humanity, the unique God for different cultures of free humans. The way to freedom is by understanding necessity. We have to recall our conscience, to reintegrate our mind and spirit, and to remember that society has to assist humans to live among humans.

[1]Prof., Electronics, Telecommunications, and IT Dept University POLITEHNICA of Bucharest, tudor-razvan@ieee.org

Keywords: *Faith* = Inspiration × Intuition × Imagination is linked to.*Intelligence* = Consciousness × Adaptability × Intention by *Conscience* = Consciousness × Inspiration *Simulation* ⊂ Function × Structure, Faith and Intelligence are ☯ in our Life. (Way, Truth, Life)

Legend: *Mathêma = science; Fisn = nature, universe, world, landscape; Tekhnè = arts; Theos = god, Theôria = procession, Theorein = to contemplate; (Greek); Calculus = little stone; Ingenue = free minded; Ratio = number, account. (Latin)*

1. Basic concepts

To begin was the word. Words enable us to express ourselves, to be humans among humans. Expressions are complex, so they have to be hierarchic in order to be comprehensible. Words are sequences of letters, sentences are sequences of words, and texts are sequences of sentences. Phrases, paragraphs, subchapters, chapters, volumes, etc can enrich the levels of the textual hierarchy. The *hierarchy* is not necessary linear. The basic *hierarchic type* is tree-like, to optimally represent the generic strategy of *divide et impera et intellige*, or even graph-like, in order not to constrain the links between levels. A (finite) sequence is an ordered (finite) set, i.e., a function that applies the (first n) natural numbers on the set M: $seq \in IN \rightarrow M$ / $seq \in IN_n \rightarrow M$, $IN_n = \{i \in IN: 1 \leq i \leq n\}$.

Class, *concept*, *term* are aspects (syntax, semantics, pragmatics) of the expression. Class is a primitive notion. Set is a class that belongs to another class. The set operations are paradigmatic: serial (∪), parallel (×), or hierarchic ($\wp$ - set of all parts). The possible expressions form a *language*; any language is defined by its syntax, semantics, and pragmatics; the rules of each of the former defining components refer, respectively, to correct construction, interpretation, and application. The syntax is determined grammatically: grammars are of different types that can build a hierarchy that corresponds to the reciprocal inclusion of the defined languages.

Grammar is a language that refers to the language that grammar defines, i.e., is beyond the defined language - a metalanguage. This is another hierarchy type than modularization (of a text) or inclusion (of the languages due to the stronger rules of the defining grammars). Its definition is based upon the principle that each level is a metalevel of its inferior ones. Further, the language can be symbolic, and symbols can symbolize other symbols, what reveals another hierarchy type. We classified, we symbolized, we divided into modules, and we reflected an inferior level (language) on a higher one (grammar). Grammar is a language, so it has a grammar, which, if isomorphic to the initial grammar or to the language itself, would mean that we obtained a reflexive language, i.e., capable to express itself.

Classes, *symbols*, and *modules* permit the construction of a *system* that structurally implements a function expressed in a language, i.e., *behavior*. In the

same way, with classes, symbols, and modules, the behavior of a structurally described system can be determined. Another hierarchy type orders the variety of languages that describe the function and the structure, the *simulation* hierarchy. It assists passing from the goal function, constrained by functional parameters, to the structural form, and the inverse transformation that determines the mathematical function or the physical behavior of a system characterized by structural properties.

Hierarchic types are stratified structures. The levels represent different domains (abstract or concrete). *Abstraction* links the different autonomous levels inducing an order relation, what permits to consider superior and inferior levels - lattice. The hierarchic principle can be applied both to knowledge and to simulation, to maintain correctness when the complexity is rising. The decomposition of the problem on more abstraction levels helps to bind locally the complexity. The systematic design that results from the hierarchic approach assures an almost correctness by construction, i.e., the complex verification/ optimization becomes less hard and more understandable.

The different *hierarchy types* correspond to the way of abstraction they reflect, containing *hierarchic types* of common abstraction way. *Hierarchy types* (concepts, symbols, modules) correspond to (syntax, semantics, pragmatics) of the hierarchic language that expresses the *intelligent simulation*, resulting by integration in the *hierarchic simulation* of the associated knowledge hierarchy, which represents a reflexive abstraction that converges to self-awareness of the adaptable intentional simulation. Hierarchy = syntax (abstraction).// comment

- *Class* hierarchy (↑concepts) ↔ virtual object-oriented framework to represent any type, based on form-contents dichotomy, modularity, inheritance, and polymorphism // ↑abstraction goal
- *Symbol* hierarchy (↑metaphors) ↔ gradual symbolizing formalism for any type
- *Module* hierarchy (↑strategies) ↔ management system for any type, by recursive decomposition in autonomous modules
- *Construction* hierarchy (↑simulation) ↔ simulation template (design/ verification/ optimization/ test) with different autonomous levels for any description abstraction degree
- *Knowledge*/ *consciousness* hierarchy (↑theory) ↔ reflexive abstraction, each level aiming to know all inferior levels, including itself; it is the first step to model the Conscience.

The hierarchic types are objects of equivalent categories (functorial isomorphic) that formally represent hierarchy types. The consciousness hierarchy type communicates to the simplifying hierarchy types (the first four types) by countervariant functors, while the simplifying types are mutually connected by covariant functors. [1]

Researching intelligence by simulating it, to enable intelligent simulation, demands the study of combined essential mathematical structures (algebra, order, topology), to understand the different hierarchy/ abstraction types. As it is a hierarchic relation between static and dynamic structures, and even between structural and functional, the simulation can contribute essentially to understand the human mind. As in any dichotomy, *Intelligence* and *Faith* can converge toward integration, or can destroy one another if not associated. *Conscience* is the link between them.

- *Function* is a transformation that can be mathematically formalized, $f \in$ Domain $\rightarrow$ Codomain or physically instantiated as temporal behavior.
- *Structure* is a set of properties that characterize a mathematical or physical space.
- The properties can be constant or variable in time, reflecting static or dynamic structures.
- *Simulation* is the relation between function and structure. Structured set = (Set, structure).
- *Language/ System* is a generic form of a mathematical/ physical model.
- *Model* results from an inversion-able representation of the simulation object.
- *Abstraction* is a human defining capacity that enables him to think.
- *Hierarchy* is a functional/ structural concept that fulfils mathematically/ physically the concept of abstraction.

God is *in us*–as the Faith is part of our definition, *with us*–by the others, and *for us*–by the spiritual e*volution*, that is first conditioned, and then assisted, to be followed, by the social one. To prevent the danger of dichotomy, we concentrate in three different ways on the unique Reality (*Plato*):

- *Art for the art* - to look for the essential Way,
- *Science with God's fear* - to search the existential Truth encouraged by the Faith, and
- *Engineering* - to understand the Being concentrating our Mind on the Spirit during our Life.

*Das schöne wahre Gute*Johann Wolfgang von Goethe

2. Abstraction. Hierarchy. Hierarchic Simulation

Simulation is the relationship between function and structure. *Architecture* is the closest functional structure to simulation. The power to abstract is the crucial difference between human and any other natural being. The abstraction can be simplifying or reflexive. The *simplifying abstraction* concentrates on a superior level the information that is considered essential for the current simulation approach. Reducing the informational complexity has in view to clear the operation and to ease its formalism; it can be only quantitative but also qualitative, i.e., it can affect the simulability of different aspects of the simulation object. The *reflexive abstraction*, expressed as the knowledge hierarchy type, tries

to understand itself better on each superior level, by better understanding more of the inferior levels. We extend the reconfigurability to the simulation itself (Fig.1).

First, by a self-aware simulation, we get self-control of the simulation process; we build a knowledge hierarchy corresponding to the simulation hierarchy. Then, by expressing both simulation and knowledge hierarchy in the reference system of the basic hierarchy types (classes, symbols, modules), we create the context for a self-organization of the simulation. The triad of the basic hierarchy types corresponds to the fundamental partition of the real life (beauty-arts, truth-science, good-engineering), which has to be continuously integrated by *philosophy* (essence, existence, being). Therefore, we model the Conscience for simulating the Intelligence to reach for intelligent simulation. Both intelligent simulation and Intelligence simulation demand transcending the present limits of computability toward simulability, by an intensive effort on extensive research to integrate essential mathematical and physical knowledge guided by philosophical goals.

Arts and science are equally noble, even if one appears rather spiritual and the other rather mental-/ matter-oriented. Their alliance is vital and demonstrates the unsolvability of the nowadays *spirit-matter dichotomy*, and of all resulted secondary dichotomies, actually functionally generated by the *space-time dichotomy* - necessary to the human *evolution*. *Society* is only the memory of the past, the manager of the present problems, and the assurance for a right future. We have to live together in respect of the others on the way to understand each other, in order to evolve toward essential beings for an integrated existence. *Human among humans* should reflect a strategic equilibrium, without hiding or even violating, as happens nowadays, the principle that the society has to assist the individual, to educate him/her correctly, enough and unconditioned, and to help her/him by an intelligent Faith to search and research the Unknown; this can be interpreted as the *unique God* representing the absolute freedom by understanding all the necessities, and the absolute unity by closing all the d*ivide et impera et intellige* necessary to the Way to look for the Truth along the Life

Reason is an extension of the Nature. Nature is not an ephemeral context, but the matter–soft and hard/ information and energy–we are built of in order to develop spiritually. The integration experiments for the Spirit-Matter dichotomy failed because of their extremism. The present society is extremely materialistic, and tries to destroy every trace of ideal nowadays mentally realizable. We have to surpass the limits imposed by the essential dichotomy by a unique Ideal, named God, that should be constructive by continuous intelligent reconfiguration. The most benign social system is not democracy, if the education for any human is not granted.

// Class Human - informal definition *Human is human among Humans*; class ≈ concept

Human = human (Humans)// Class :: function

human ∈ Faith × Intelligence → Faith × Intelligence// function of a human

Humans = ({humans}, Eternity/ Evolution-based structure) // structured set of humans

evolution ∈ (Hunger×Fear×Love) × (Engineering×Science×Arts) → Engineering × Science × Arts

Mathematics ⊂ Arts = Human:: search_for_Beauty (Arts, Science, Engineering)

Physics=Science(natural∪social)=Human::research_upon_Truth(Arts,Science,Engineering)

Engineering = Human:: construction_of_Good (Arts, Science, Engineering) // function of class Human

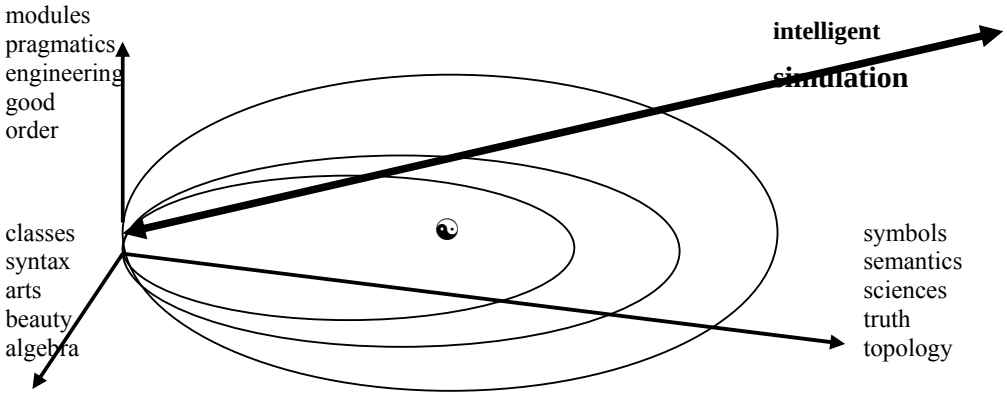

Fig. 1Extended H-diagram

The basic hierarchy types (classes, symbols, modules) correspond to (syntax, semantics, pragmatics) of the hierarchic language expressing the intelligent simulation;

this results from the integration of simulation hierarchy with its knowledge counterpart meaning a reflexive abstraction converging to self-consciousness of the intended adaptable simulation.

The yin-yang represents the absolute functionality and the waves are increasingly structured hierarchy levels, both for simulation as for knowledge. Yin-Yang can represent by rotation any dichotomy, but also any integrated triad. Each of the nondeterministically separated complementary pairs is functionally structured like (interface, kernel, ambassador of the complement). The yin-yang model is formed of three tangent circles emphasizing the centers of the inner ones. It retains only the essence of a dichotomy symbol that suggests a complete

integration of the parts without loss of autonomy, realized by vicinity and pointing one to another.

The Chinese symbol reflects the importance of *creation as love for something else*.

Three circles, each tangent to the others, models *a partition of something to be understood in order to get further*, say the center of Europe. Circle is *cerc* only in our Latin mother tongue, a perfect expression: *Cer* (sky) is the infinite, *cerc* is the finite representation of infinite by the permanent link from the (never) begin to the (never) end. *Cerc* means perfection, which we permanently desire, therefore there exist integer numbers, having a perfect and beautiful theory, but not forgetting to continue the evolution searching and researching further. The western Europeans attain *research*/ *rechercher* by recursive *search*/ *chercher*. Romanian language helps us to this by *cercetare*. π is the most famous real number (*Pythagoras*)

The election system should be hierarchic, and the temporary separation of the power should be correct and complete, to result in autonomous strategy, tactics, and constructive critics. [2] Religion had to learn us about God's existence in our being. Philosophy is not a specialty but a human right. [3] There have to be schools to prepare the teachers of philosophy for the other humans. These schools have to develop also respect for those that look for the Way on one of the three alternative paths that correspond to the fundamental partition (arts, science, engineering). Philosophy has to learn us about essence, existence, and being. Our conscience represents the essence of our existence as being; i.e., it tells us that God is in ourselves, for ourselves, and among ourselves. Further, we have to be to search our essence researching our existence. [4] As recently the essential *divide et impera* do not *intellige*, philosophers should be masters in:

- Arts–especially great mathematicians, and others that, aware or not, compose mathematically
- Science–physicists, and those that do not forget their science is a chapter of physics
- Engineering–mostly those working in domains that attain the limits of the pure Reason.

Mathematics is one of the arts. The music is at least as beautiful and expressive, but mathematics does not demand an extraordinary talent, allows a reasonable dialog about it, and has well-defined reconfigurable limits of that it is aware. Mathematics has to be educated as soon as possible and has not to be confounded with its handcraft. The music gets more often out of its character. Anyway, the two arts evolved together: *Bach*, *Vivaldi*, *Haydn* were musically gifted mathematicians preferring the liberty of the music to the bands of the Reason. Reason, as initial zone, makes mathematics more sure but less charming than the other arts that refer directly to the Reality: music, literature, and sculpture. Visual

arts are too Nature-dependent because seeing is the most used sense for the human natural being. The mathematics school is continuous, whereby sculpture, literature, and music can generate sooner higher singular peaks: *Buonaroti*, *Shakespeare*, *Beethoven*. Arts are free. Mathematics first expressed reasonably that Reality cannot be known only by Reason, and guides science and engineering to correct integration. *Arts for the arts* is a self-definition, the liberty to create Beauty by thesis-antithesis-synthesis - dialectic principle that governs the evolution by closure to the inverse.

Physics is the Science. The other natural/ social sciences are its chapters, even if they are not yet aware of it, or just try to return to their riverbed by intermediary specialties instead of integrative bridges. As any artificial system, the society is structured on natural bases, and developed by natural laws. While the modern age, these laws were forced towards Reason, and recently they got out of control. The social laws got also unreasonable–in the bad sense. Physics is essential for the constructive reconfiguration of the Faith. It has to integrate the fundamental forces in a theory, and all natural and social sciences as chapters. Social sciences study a universe as complex and nondeterministic as the natural one, therefore mathematics is at least as important. Recognizing physics as fundamental, mathematics could be more directly inspired by the sciences. Science raises the fear of unknown, and the research inspired by it, to zones that are more abstract. It is hierarchically defined, *with God's Fear*, looking for the Truth. Its evolution bases on qualitative leap consequent to consistent and convergent quantitative accumulation.

Engineering is most frequently both art and science, and is as important as arts and sciences in the fundamental partition of the Reality needed for evolution. However, it is more dangerous than its alternative approaches, of which it has to be strictly bridled. Reasons are twofold: its result, called *technology*, is defined by its complement–it is not superior to this, and it does not impose spiritual proximity between the creator and the user–it can be applied in a complete different scope than it was generated. However, any engineering is the homonymous complement of a special science that collaborates with mathematics. Therefore, this problem is solved if the sciences are integrated into physics and if mathematics remains one of the arts. Engineering should develop closer to mathematics–approach, integration of parts, not only applying techniques, and to science –courage, multiple perspectives, not only regarding the results. Concentrating exclusively to the Good in the life is very dangerous, as the third part of Reality, also called *mental world*, is defined by its complement, and therefore is not superior to it if not closely constrained by Arts and Science. Denying the negation is not a context-free game. [5]

Dear God, search from the Sky, see and research this Vineyard, implanted by Your Right, and complete it Orthodox Pantocrator

Divide et impera et intellige has three parts as *alle guten Dinge sind drei* of the most philosophic European people. Mathematics develops by three basic structure types, integrating them. We divide our Universe in three worlds: essence, existence, and being. We divide our existence in three interdependent components: arts, science, and engineering corresponding to our beauty-loving ideas, our truth-searching efforts, and our good-oriented constructions. The third part is presently exaggerated to exclusivity. As the Reality contains abstract ideas, even if physics could explain everything as being discrete, the power of continuum cannot be forgotten. The analog engineering cannot be neglected in modeling and simulation. Physics permanently uses as dichotomy the discrete-continuous, while the engineering-technology just adapts intuitively–as any primitive life form–to the requests of a consumption-oriented society (resembling to primitive life). Presently engineering-technology escaped from the control of the inspiring arts, and of the consciousness for the science conditioning its existence**.** The election system should be hierarchic, and the temporary separation of the power should be correct and complete, to result in autonomous strategy, tactics, and constructive critics.

3. Evolution by Closure to the Inverse

For physical or philosophical orientation, we need *cardinal points*. To inspire ourselves of the most pure of the arts, we learn about *cardinal numbers*– although, being sincere, mathematics leads the way to show that nothing is pure, so without leaving anything behind, the Way has to be followed further. Cardinal numbers are numbers of elements in a set; sets are mostly infinite. The Nature demands the least infinity and is defined by (0, successor, induction). Adding is in Nature's definition. However, the inverse operation, subtraction, needs negative numbers. We close mathematically the Nature to an *integer* that opens the physics for recognizing the limits of the Reason (electrons), in the meanwhile, attracting marvelous engineering solutions for different technologies. Electronics is among the most advanced engineering sciences; therefore, it has to be practiced by the most conscient human beings. Recurrent addition is multiplication, a most important parameter for the Nature. Mathematics closes the integers to the multiplication inverse, defining the rational numbers.

These are not more than the naturals, but we can do many useful things with the Reason, from strategy to computer. So *what else do we need?* say too many, forgetting that the limits of the, so-called, *pure Reason* are caused by the fact that it bounds itself to close the Adaptability to discrete/ sequential operations. Thanks God, neither mathematicians, nor physicists accept all-happiness [6]. They discover in three ways (order, algebra, analysis), which assisted all of them to think together, the power of continuum and that of the patience. In this context, *mathematicians and physicists* means the theorem, natural laws, or even new

approach discoverers, and more, the engineers that understand the essential of mathematics and of physics, and sometimes suggest to these real approaches or solutions.

The *Ackermann-Peter* function–anticipated by the recursive functions hierarchy of *Gheorghe Sudan*–shows an intuitive model for discrete computability and the limits of discrete/ sequential computation: the primitive-recursive functions are obtained of some elementary operations of the set of natural functions with more natural variables by closure to composition and recurrence. The model is not complete without an extension for implicit functions, i.e., defined by equations, to denumerable-recursive functions, as the APS function raises quicker than any primitive-recursive function. The recursive operation construction is very inspired–showing that the recurrent power rising is too complex–and suggests the existence of an implicit link between the limits of the discrete calculus: complexity and computability. // ack rises with x (for n = 1, 2, 3) +, *-like, exponentially

long unsigned ack (unsigned n, long unsigned x){//ack$\in IN^2 \to IN$
return !n? x+1 : !x ? ack(n-1,1) : ack(n-1,ack(n,x-1));}

Presently, we talk about electronic computers, but the nowadays trend is to copy from the living Nature, i.e., the *emulation* of the advantages the living beings show to achieve unconsciously complex duties. The vanguard domains are biotechnology and computational intelligence. We understand well neither Life nor Intelligence, so it looks like *Der Zauberlehrling*. More important is that emulation is less human than simulation, so they should always develop in parallel, permanently exchanging experience.

Reality does not reduce to Nature, as card (IN) is strictly inferior to card (IR). Reason is the closure of the Nature relative to the primary operations, as $\mathbb{Q}$ is the closure of IN to the inverse operations of addition and multiplication. However, the Reason is dense in Reality, as the real numbers are the analytical closure of the rational numbers i.e., IR = $\{\lim_{n\to\infty}(q_n)$: $(q_n)\in IN\to\mathbb{Q}\}$. Reality extends beyond Nature and Reason, not just for the quality of the quantity, but also regarding the power of transforming operations. IR is the closure of $\mathbb{Q}$ to the inverse of power rising – the last arithmetic operation resulted by recurrence of the prior one, which can be pursued by Reason. Further, the closure regarding the inclusion order–the set of all subsets of IN, $\mathbb{Z}$, or $\mathbb{Q}$, in general, of countable sets, is the uncountable set of real numbers. IR represents the power of continuum. To get from real to complex numbers is just a matter of Imagination.

We should not forget the third meaning of *cardinal* that points to an unwise use of *divide et impera et intellige* as *when two fight, the third wins*. This means to intervene only when the fighting forces begin to get unbalanced, in favor of the less strong, to conquer all fighters. For complete victory, both the pseudo-ally and the pseudo-enemy are firmly assisted, discretely or continuously, to loose

control, because of all-(un)happiness. The 20th century is a too convincing example.

Reason closes the Nature to the inverse of natural operations. Reality is the closure of the Reason to the inverse of artificial operations, or to the reasonably deducted infinite, or to an order over the Being itself. We know that if there were no cardinal number between the natural/ integer/ rational discrete and that of the real continuum, then the logic would include the principle of the excluded tierce. This hurts the Human, who is fond of nuances. Therefore, we can prove that there is an intermediary level between Reason and Reality (*non-constructive*). There are angels between Human and God said the wise. The density of Reason into Reality means that every real is the limit of a sequence of rationales. Therefore, we hear nowadays that if we master the Reason, Reality becomes a complexity problem, i.e., speed of convergence. We dare use mathematics as metaphor for the relation between Nature and Reality, but it is only a correct inspiring analogy. IR is an initial step in mathematics for algebra, topology, order, or their collaboration. Mathematics is for Reality just one of the favorite ways to get the Human closer to it. There were times of the Reason when mathematics was free, creating itself the necessities, and even if physics had sometimes to make the needs aware to mathematics, they both always followed the way to Reality. Nowadays, there is no *Nobel* Prize for mathematics, only for its economical applications. Nowadays, there exists no liberty by understood necessity, only by satisfied economical needs. Nowadays, Reason cannot reflect the Reality. The density of IQ in IR shows that between any two real numbers there is a rational one. Therefore, Reality is much more than Reason can even imagine, but something reasonable exists between any two real objects (*non-intuitive*).

Neither Intuition nor Reason arrives to something that mathematics proves elementary. As any true art or beautiful science of the ideas or the phenomena, mathematics does not limit itself to either Intuition or Reason, allowing them to collaborate by Conscience. We touched the *Mathematics-Physics* that the modern School considered alternative to Human. However, every human has to be hallowed with the unique strategy for consistent education, which does not reduce but amplifies the receptivity and imagination for any human work. The recent School replaces the alliance Beauty-Truth in the most pure form with an advertising name *Mathematics-Informatics*, considering itself a part of the consumption society, destructor of Spirit and Human mind. Informatics is a first result of the collaboration Arts-Science-Engineering, very inspiring de jure, but too exploited de facto, for the grotesque materialistic exaggeration that all we need is good, and that engineering is the only creative activity, deserving development in any direction, from spiritual toys for all ages to technological drugs, arms included.

The Faith experiment, based on concentration, search, and construction,

took place in the Middle Age by spiritual and chivalrous search, mediated by Masonic buildings. The Cathedrals were the symbol of the coming *revolutions* that intended to institute the constructive Faith as basis of the human society. The *USA* Constitution contains the universal measure of money, but *Napoleon*'s Code witnesses that the prepared superior level of the human-social evolution was not any sort of capitalism. Now, the society is conservative - it tries to last forever at an evolution level, using a common measure. Everything is evaluable although the essence of our existence for being is not measurable.

The so-called pure Reason, i.e., the context-free Reason–most adaptable, conscious only for having, intended by the tactics of the consumption society, and totally unfaithful, gives the necessary force to stagnation or even to choosing a wrong way.

Unfaithful means here that the components of the Faith (Inspiration, Intuition, Imagination) are used separately to serve the competition for the Good that makes present Life credible. However, the society is less than reasonable, whereby, the irrational of arts, particularly in mathematics, is more than reasonable, opening the way to Reality by closure to an essential and radical operation. To master the *New Power* of the continuum is beyond Intuition and Reason, if they do not integrate by Conscience and do not collaborate by Imagination and Intention.

The historical experiment of the *pure Reason* was the necessary intellectual condition of the first, and by now–the last, social revolution. The initial goal of this event came from the prior historical experiment of *pure Faith*, being a reintegration of the ways to search for Spirit from Matter (knights) and for Matter from Spirit (monks). It failed because it kept the arms, the wars, and the social classes against it had risen. More important, the experiment continued beyond its historical limits, what created the context to renounce to human dignity in order to reduce the human mind to adaptability and to throw Conscience and Faith into facultative. The less constructive thinking of pure Reason weakened the human mind and made possible to restrict the point of views to the most dangerous of them. The number of alternative paths, totally different but convergent to Reality, must be 3–the last prime successor of another prime. The concentration of the mind on the reasonable control of the Adaptability followed the Faith experiment, which tried to bring into individual and social conscience that the human has chosen the evolution without disregarding the Eternity or knowing the Way. The mental revolution selected a primitive form of *divide et impera et intellige*, to begin researching what is partially known, leaving the unknown to be approached when the first step is finished. If this intention is not forgotten, *intellige* is contained in the *impera* of the unknown that has to begin after the *impera* of the partial known, with the completed knowledge that has resulted. This first step was done simultaneously by the institution that pretends to

serve God–*Luther*, the knight Popes, and by the most human Reality approach–the Arts (*Rinascimento*, *Descartes*). Their strategy was human-oriented.

The contradictory sentence *to serve God* had sense while the Church simulated conscience. Perhaps was its partition thought as *divide et impera et intellige* for the Way–Catholic, the Truth–Orthodox, and the Life–Evangelic, but there came no *Intellige*, and all of the alternatives fell into the exaggerating *-ism*. Perhaps this is analogous for Buddhists searching a beautiful Way, Christians researching a true Truth, and Jews engineering a good Life. But many of us, of any religion, and respecting the traditions, are conscious of the Way to follow, do not expect anything from a metareal God (sounds like material), and are free to laugh even of their deepest Faith. Moreover, they are able to have a good Life, just enough to concentrate on the Truth by following a beautiful Way.

The concentration of the society on the material component of the human existence was necessary to liberate them of inhuman problems, not to attract the humans on secondary paths. Antique Greece is an inspiring model (substituting slaves with intelligent systems). The Reason experiment had to finish two centuries ago, when:

- The pure Reason experiment climaxed by a lot of contemporary geniuses, proving that people were to select wisely and to construct in good understanding and courageously a society to encourages/ assists them to evolve beyond the attained peaks: *Beethoven*, *Mozart*, *Gauß*, *Cauchy*, *Fourier*, *Laplace*, *Goethe*, *Schiller*, *Franklin*, *Kant* or *Hegel*;
- The cathedral builders tried to extend their work at a continental scale, neglecting the people on the building area, whose culture did not concentrate on *to have* but godly simple on *to be*;
- *Napoleon*, a genius of the military and social strategy art, showed that a new social form, reasonable in his plans, cannot be imposed by the force against the revolution had fought. We note that a century after Bonaparte, a German strategy genius, Otto von Bismarck, learning from his predecessor's experience, was more successful in unifying Europe. However, this time the materialistic forces were already masters of exploiting the instabilities, and hurried up to transform Europe in a laboratory to compromise any idealistic movement. They helped the generation of these movements and directed them to terrorism. As we said, the pure Reason experiment had the form: complete the better-known part (Bonaparte) to its limits (Bismarck), to have more chances beyond the limits.

The falling and remaining in materialism hurt a lot both Nature and Human. The importance of the experiment was significant, but its continuation after the results could be interpreted has killed countless people and cultures. Nowadays the materialism torments increasingly, threatening the future, although adaptability-based Reason cannot explain/ control thoughts, even if sequential is

extended to unlimited parallel/ nondeterministic. Anyway, these desired operational properties could be found mainly in the right Faith-oriented side of the mind. Further, the difference between continuous and nondeterministic sequential is positive. Therefore, the Reason has to be Faith-dependent completed to Intelligence. A being needs more than Intuition and Adaptability to surpass the Matter by Spirit; only the integration of Intuition and Adaptability by Conscience can explain the Human being. The prior considerations inspire us to propose the thesis:

Conscience is the closure to (*knowledge* o *simulation*)$^{-1}$ *of Conscience*

Initially, Conscience = Consciousness

The essential limit of discrete computability, inherited by the computational intelligence, is generated by the necessity for self-reference to integrate the level knowledge with metalevel knowledge in Conscience modeling. A hierarchically expressing reflexive abstraction can represent the conscient knowledge. The aspects of the Reality, and of the human mind reflecting it, have not to be neglected, although they are neither constructive nor intuitive. A way from Reason to Intelligence is to integrate Consciousness and Intention, then further to integrate Intelligence and Faith to become *Reality-aware*. Transforming the abstraction into comprehensive construction can be the *goal* of the Human among Humans, *unique God* for different cultures of free humans.

Freedom is understood necessity Georg Wilhelm Friedrich Hegel

We have to remind our conscience to integrate our mind. We have to remind ourselves that society has the duty to assist humans to live among humans. We have to stop society to be more important then the Human. This is nowadays the case, and we are on the way to live in an aunt hill/ a swarm/ a herd/ a flock/ a stud, or even a pack/ a horde/ a crowd/ a mob. An operating system serves to the autonomous programs both as link to the hard as for development of the soft. Analogous, the minimal unconditioned tasks of the society are health and education for everyone, encouragement of culture and research for any Human, i.e., human with conscience. The history of the common measure is:

... ← Philosophy ← human Culture ← special Knowledge ← economic Force ← physical Force

We could consider just the simplifying types of hierarchy (classes, symbols, modules) and then express the construction, hoping to aim the absolute liberty, if we considered God as the simplest, totally unconstrained, essence of the Reality. However, we can simulate/ construct/ work/ live, associating knowledge hierarchies to all our activities, aiming to constructively understand the most complex absolute necessity–defining God. Abstraction–reflexive and simplifying–is the human gift for going beyond natural limits, meanwhile extending pure reason to real intelligence. Metaphor is a popular instance: [7]

God is the absolute abstraction → the evolution goal for faith-assisted

intelligence

Conscience is individual (link faith-intelligence), social (local-contextual relations), and universal (sense for Reality). It appeared by *divide et impera et intellige* of the community conscience, proper to the eternity-oriented human structure.

The following relations describe a way to start toward intelligent simulation:

$$\text{simulation} \in \text{Simulation} \subseteq \text{Function} \times \text{Structure} \Leftrightarrow \text{Knowledge} \Leftarrow \text{Intelligence :: information ();}$$

$$\text{Intention} \Leftarrow |\text{Inspiration - Adaptability}|;\text{Imagination} \Leftarrow |\text{Intuition - Consciousness}|;$$

$$\text{Adaptability} \Leftarrow \text{simplifyingAbstraction (Imagination); Consciousness} \Leftarrow \text{reflexiveAbstraction (Intention);}$$

Although intuitive and hopefully inspired, we begin neglecting intuition, inspiration, and imagination essential but too primitive for reasonable understanding. We formalize reflexive abstraction by knowledge hierarchy and simplifying abstraction by simulation hierarchy:Consciousness = knowledge ° simulation (Consciousness)

The fixed-point relation suggests modeling consciousness by association of a knowledge level to every hierarchic level of the simulation process. To solve the fixed-point problem we construct a metric space where (knowledge°simulation) is a contraction, i.e., the construction implied elements come closer progressively in the formal understanding of the formal construct. Further, we will have to approach:

$$\text{Consciousness} = \text{knowledge (intention (Inspiration, simulation (imagination (Intuition, Consciousness))))}$$

A model template defines the model universe as a mathematical theory or as a simulation paradigm. Every entity has behavior (external relations) and structure (internal relations). Behavior can be functional (context-free) or procedural (context-dependent).

An *algorithm* is a computer simulable entity, representing computability, behavior-oriented (understanding, verification, learning) or structure-oriented (construction, design, plan). The algorithmic approach is equivalent to the formal one. If an expression is consistent to a formal system, then there is an algorithm that can confirm it. Reciprocally, for a verification algorithm of the mathematical sentences, a formal system can be defined, that considers true just those expressions in the closure of the algorithm results set, to the considered logic operations.

The best known (equivalent) formalisms for sequential computability based on pure reason are: formal axiomatic systems - *Hilbert*, construction models - *Gödel*, λ-calculus - *Church*, recursive functions - *Kleene*, *Post* combinatorics,

Turing machines, formal languages - *Chomsky*, and normal algorithms - *Markov* jr. These wonderful men initiated a revival of the pure Reason experiment, aware of its scope. This was possible because the arts–especially mathematics, the physics-based sciences, as the mathematics-inspired and physics-assisted engineering-activities evolved independently of the social order. This was due to the intelligent faith of their masters and of the free humans that understood them. [8]

The evolving Intelligence is the faculty to transform (analyze/ synthesize/ modify) abstract/ natural/ artificial objects, and representations in the world of (arts, sciences, engineering-technology), especially hierarchic and reflexive: ideas about ideas, and how to come to ideas; objects to transform objects; representations of representations, and how to build/ understand representations.

Eternity means abstraction of time, from the point of view of human evolution. However, the humans that lived in eternity had not performed the space-temporal partition of the Reality. The knights searched for the Graal, the monks for supreme Spirit, and the shepherds the lost sheep. The knights counted their victories, the monks their rosaries, the shepherds their sheep, without considering this natural operation as essentially human. Evolution depends on the initial design of the mental faculties for whole system surviving, but also on the space-time context of communication among intelligent agents. The alternative ways to extend the computability concept are suggested in works of the philosophical German literature: the essential ideas point the unconscious part of the mind, concentrating on: the mental world of the Good–managed technology, the physical world of the Truth–researched scientifically, and the ideal world of the Beauty–discovered by arts. [9]

1. Faust (*Goethe*): heuristics - risk competence for performance, based on imagination
2. Das Glasperlenspiel (*Hermann Hesse*): natural unlimited parallel/ nondeterministic- intuitive.
3. Der Zauberberg (*Thomas Mann*): self-referential knowledge - needs hierarchic reconciliation of discrete structure with continuous reaction, to inspire the Way to Reality.

4. Conclusions on Intelligent Evolution

Mathematics is in all alternative ways, and in all the worlds supporting our presence in the unique World: algebra combines for Beauty, topology searches the Truth, and order emphasizes the Good. Mathematical measurability is a way to formalize simulability. [10]

- *Hilbert* spaces ground the behavioral model for quantum physics, more precisely, the part that is independent of any concrete intervention (in the world of abstractions). The link to the complementary part of the model, representing the

interface to the physical world, cannot be algorithmically expressed, what suggests that the model is not correct in the Reality.

- *Banach* algebra introduce, additional to the topological vector spaces, a commutative multiplication that, by an adequate transformation, results in a commutative functional composition, eliminating one of the most important constraints in a classical sequential model.
- Fixed points can help to formalize the simulation goal.
- Inductive limits direct the convergence of hierarchic types, enabling the compatibility of partial simulations and contributing to the correctness by construction of the design.
- Reflexive topological vector spaces contain the necessary ingredients for the representation of the Conscience, by reflecting the adaptability in the variability of the space dimensions.
- Self-adjoint operators and eigenvalues/-vectors assist the knowledge concentration/ stability.
- Inseparable spaces can instrument the understanding of inspiration and intuition.

An analog computability and an integrated mathematical-physical-comprehensible modeling are promising ways. Simulability is computability using the power of continuum: analog electronics, metaphorical thinking, and unrestricted mathematics. [11]

Nichts ist mir wichtiger auf dieser Welt als mehr von Gottes Gedanken zu wissen
Albert Einstein

- Simulability demands explicit formalization of the knowledge hierarchy in the formal system frame. Inference is a discrete strategy of intelligence to advance in knowledge. The monotonous inference means conclusion conservation when new hypotheses are added. The daily, scientific, engineering inference is not monotonous; therefore, the prior conclusions must be revised when knowledge enriches–*reconfiguration*.
- Mathematics grounds any inference form by an adequate formalism. Informatics is the mathematics of the algorithmic information processing. Intellectics is the mathematics of intelligence based on that of knowledge that is built around knowledge representation. *Intelligence simulation* designates the project to understand and technologically implement hard-soft a conscious adaptable knowledge generation/ processing. We changed the standard name of *artificial intelligence*, to emphasize the need to understand the simulation; everything we know on simulation approaches us to the intelligent simulation of intelligence. The system that results of intelligence simulation should be able to explain itself without referring to its internal representation, i.e., to be *conscious*, and to have a *causative* behavior due to its internal structure and independent of the exterior interpretation, i.e., it is *adaptable*. By reflexive hierarchy it get *aware* of an *intention*, and by all this, it is *intelligent*. Hierarchic simulation–assisted by

mathematics to get theoretical and formal–can lead to comprehension of the results. The approach is concentrated on the knowledge hierarchies, to simulate metaknowledge, for the system's adaptability, and for searching the way to simulate the Conscience.

• *Theory is an order on the knowledge while searching for the absolute abstraction named God*, i.e., to build/ understand Intelligence assisted by Faith for living in Beauty, Truth, and Good.

God is unique!

• We looked for and evidentiated necessary conditions for the convergence of the three fundamental attributes of the human life, Beauty, Truth, and Good, toward a common measure aiming philosophy.*Uncountable are His Ways*!

• The convergence process of evolution demands fight with the Time, having as ally the Structure. Sometimes the Structure is too conservative: it has to be reconfigured, at abstract and/or at concrete levels. Conscience needs continuous reaction, further than discrete recurrence. Social and individual Conscience are rather divergent nowadays, i.e., we only performed *divide et impera*, neglecting *et intellige*. To correct this state cannot be delayed!

Hierarchic are His plans!

• Democracy has to be hierarchic, and education has to open to Reality by arts–the most intelligible being mathematics, and to worship Nature by physics and sports.

Spiritus sanus in mens sana in corpore sano!

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