DUALITIES AND UNIVERSALITY OF ETHICS IN SCIENCE

Emmanuel Chauvet[*]

Laboratoire de Physique Théorique Fondamentale en PACA, 332 avenue du Maréchal Juin, 92100 Boulogne-Billancourt, France

Abstract

Neural networks are studied from a probabilistic point of view through a mathematical formalism relying initially on the use of bistochastic matrices: each coefficient of such a matrix is the activation probability of one neuron by another one of the N neurons of a network. The concept of entropy of evolution S is developed and enables to establish that the minimization of this entropy induces an order in the network characterized by loops of neurons. The mind-body problem is tackled through the oscillations of S which lead to characterizing some kinds of pathology at low frequencies and when the least action principle applies. The cognitive model presents analogies with a new concept of universe in which each neuron corresponds to a state having a given set of properties and then loops characterize corpuscles while oscillations of S goes with the creation of waves. Both systems show duality: mind-body for the former and wave-corpuscle for the latter. The theory based on psychoanalytical concepts widens them in order to make them fit in a scientific approach respecting a three-stage cycle based on experimentation, observation and interpretation. This cycle is put forward through the mathematical formalism developed in order to support an analogy between cognition and ideas of God. Such an analogy enables to conceive a permanent and supreme being as the origin and the master of a multitude of possible universes through an inevitable anthropomorphism. Ethics is also tackled from the angle of this cycle, as being in close relation with choices and action, while morality is a normative drive at a political and religious level. The former is individual and tends to question general principles whereas moral codes are intended to be universal and to be applied to everybody. Theological principles are proposed to explain this generic approach and its 'universality'.

Keywords: neural network, entropy, action, universe, basic ethics

1. Introduction

In a world of trade focused on the law of supply and demand even scholarship is a matter of business: either a scholar belongs to an academic institution and participates in the development and the building of a reputation or he/she is left outside the tracks of success and peers' recognition. However this fundamental law, when it applies to knowledge, makes of the freedom of speech

---

[*]E-mail: emmanuel.chauvet@dbmail.com

a means of conquering minds beyond resistances due to any legacy prevailing in a field of Science, culture, business, etc. But that freedom is far from being a share of the power which is necessary for policy enforcement, although it is a first democratic step towards gaining responsibilities in the public affairs.

The scholars' motto, 'publish or perish', is a real trap for those researchers who believe that their works matter – what is a necessary condition for being published – whereas the most important is that they are able to weave human networks with their peers, until becoming famous enough for being quoted by the most influential scholars and published in the journals of highest impact factor. But in order to reach such a status, a hard work is needed for understanding others' publications and values, and acknowledgement must be granted to the state of the art papers in the chosen field. This means also choosing one's discipline and abiding by its rules, methods and publication formats. Thus for being a successful scholar, the main principle is to be free to define one's own constraints, that is to say using freedom for determining oneself after entering an expertise circle although it could be considered as a speculative bubble. This speculation through a rigorous work will never be a failure if it is a solid construction: although the fifth Euclidian postulate does not apply to the wider geometrical frame of the General Relativity, Euclid's works are mathematically essential for the progress of the mathematical knowledge – particularly in school.

What matters is to gain a noticeable impact on a network so as to turn a research into profitable ideas that induce financing by decision makers or investors. The highest the impact, the strongest the credit; not only in terms of capital grants but also in terms of confidence for a researcher to be given the opportunity to share the tools or high technology devices and all other kinds of resources that great institutions can provide and afford. In this race for the excellence, sciences are embedded in the wide and wild economic struggle; they are a business like others and their ethics also matters.

The scientific background framework of this article is a generalization of neural networks (NN) which founds regularities or concepts that would enable bringing together natural NN and artificial ones without excluding cyclic or pseudo-cyclic behaviour and extends those concepts to Psychology and model driven spirituality. This generalization is abstract and theoretical. It might seem superficial because it is based on a functional approach which is independent from technical instances and applications. But it constitutes a first step towards unification of dualities of consciousness and matter, beyond the necessary disciplines or fields of Science that have prevailed with the legacy of several industrial revolutions from printing, the creation of the steam machine, the domestication of the electricity, to the digital one and others… It could be considered of marginal importance if it were not a genuine questioning on the ethics of Science.

As wrote the French philosopher Blaise Pascal [1], "the truth on this side of the Pyrenees, error on the other", knowledge is the product of a construction and for this reason it cannot be held for objective, especially when economic

stakes must be considered. The standards and the values are specific to each culture; they cannot consequently be regarded as objectively founded. Furthermore, even a cultural 'asset' that is shared by several societies presents variations from one group of people to another and relies implicitly on individual choices of life spirit. On a moral plan, principles and ethics are also choices and are applicable only in a limited context. Thus relativism is naturally founded for understanding the various and numerous roots – cultural or ethical – of the tree of knowledge whose trunk could represent the unity of a collective unconscious or common sense while constructivism would guide its branches. Each branch is free to move with the wind – various conceptual influences, paradigms or policies – and to grow with no other constraints but its connection to its trunk and some contacts with other branches, often through their ramifications. Even Science is a piece of construction, based on a set of methods, sometimes on mathematical formalisms, which are cultural assets as ethical principles – precautionary principle or banning of experiments on living beings, etc. – can also be. Those assets are melted until producing a kind of relative truth through a constructivist cycle involving past experience and observations – a set of representations of past events – , then interpretations or theories and finally an effort towards the reality through experimentations.

At early ages of humankind on Earth, before any idea of Theogony, Nature might have been celebrated through particular aspects of its expressions: the course of the Sun, the succession of the seasons, the water of the rivers or of the rain, the snow, the fire, the stone, etc. The more Man was aware of these aspects as gifts or sources of dangers or fears, the better he was able to adapt and the safer was his living. But whatever the period, Man has been a prisoner of his perceptions and of the way he has learned to interpret them, like the Allegory of the Cave – presented by Plato [2] – tends to show it. His interpretations have been so often built on fragile foundations that he has had to strengthen his thought thanks to systems of belief and to convince other members of his society that these systems he has tried to share were the truth.

When an experience has to be passed on, the easiest way to do so is not necessarily the shortest: the systems can thus be sets of rules and relations or of myths or gods' stories of which the development avoids the doubt of not finding their first causes or their origins. This cultural approach of knowledge has a major advantage: it enables to hand on the complexity of life. But its drawback is that truth is always postponed or temporarily understood in a flash of inspiration what fortunately gives the will to continue a research or to follow an intuition. Thus intuition is to Science what faith is to religion, a way of keeping one's mind up to the highest 'standards' of thinking the matter or of spirituality. This systematic approach of knowledge might be a heritage from Socrates' maieutic which consists in searching for commonly held truths involving questionable beliefs and in bringing to light their foundations for a more accurate understanding. As in the Socratic philosophy a reliable knowledge is considered as a real virtue, such a method leads to a fine determination of ethical behaviour after disentangling the relations between ideas and other concepts

built through an unavoidable constructivism and after questioning collective unconscious.

The systematic approach, when it unties the different parts of a system in order to go deeper in its description and to improve its next generation functioning, is a means of creating better systems – or sets of functions – without rejecting those which had the virtue of existing. This smooth way of making the evolution reproduces a three-stage cycle beginning by the confrontation of the existing system with the updated perception of the reality of its usefulness. Then a brainstorming enables to imagine the system of new generation: functions are reorganized, created to cover new needs, or excluded when they are not adapted. In the third stage the technologies are introduced for the final conception of the future system, writing being the basic technology enabling the knowledge transmission.

In what follows, a parallel is drawn between the applications of this cycle to a neural network on the one hand and to a simplified model of Universe on the other hand. Theological implications are introduced along the dissertation.

2. The closed simple mind model

Here is considered a set of N neurons $(X_i)_{1 \leq i \leq N}$. The probability (between 0 and 1) for X_i to activate X_j is ρ_{ij}. Although it might seem artificial, two conditions are imposed to the set of activation probabilities:

$$\forall j \quad \sum_{i=1}^{N} \rho_{ij} = 1$$

$$\forall i \quad \sum_{j=1}^{N} \rho_{ij} = 1$$

(1)

These conditions characterize the fact that all the neurons of a body are not in relation one with each other according to an even probability and that before any occurrence of a real activation, there is no clue to determine which neuron will be activated by another given neuron. The only certainty that can be stated is that if this body of minimal complexity is alive, each of its nervous cells activates at least another one. Even a low probability for the activation of several neurons is sufficient for considering that operationally these neurons can be activated in some circumstances. This probabilistic approach of a neural network is far from the models which aim at mimicking an operational activity through the use of high technology but both attempts to describe the functioning of a network of neurons are complementary.

2.1. The mind as the mirror of the environment

The first aim of operational thinking is to establish a kind of order in one mind in correlation with events connecting a body with an environment. This aim comes with a natural effort of the body's neural network to organize its

connections according to its perception and past experience. This effort to identify clear patterns, which give the feeling of an order with a non-ambiguous interpretation based on common sense or on scholarship, can be characterized by the minimization of a function like the entropy: this function is supposed to decrease when the order of a system is increasing. But the parallel drawn with the entropy vanishes when it is a question of describing transitions between states: the thermodynamic function characterizes the successive states of a system whereas the entropy of evolution is computed from the transitions – probabilities – between those states. Nevertheless in spite of this misuse of language, the entropy of evolution of the neural network can be written:

$$S = -\sum_i \sum_j \rho_{ij} \ln \rho_{ij} \qquad (2)$$

2.2. Conditions of minimal entropy

The minimum of entropy, which corresponds to a will of finding an internal order of the neural system and which is also an attempt to find an order in the perceived environment, matter or Universe, is obtained if and only if:

$$\forall i \ \forall j \quad \rho_{ij} = 0 \quad or \quad \rho_{ij} = 1 \qquad (3)$$

At the minimum of entropy, the conditions (1) imply that the matrix $\rho = \left[\rho_{ij} \right]_{1 \le i,j \le N}$ shows orbits or loops of neurons: there can be only one 1 per column and only one 1 per row and it is easy to check through the following example that the neurons are activated according to sequences. The two sequences of the matrix (4) are X_1-X_2-X_4-X_3-X_6-X_1... and X_5-X_7-X_5... and it is easy to figure out that when N is high the orbits or sequences may be longer and more numerous. The case of $\rho_{ii} = 1$ is the sign of a degeneracy which is not considered here.

$$
\begin{array}{c}
\begin{array}{ccccccc} X_1 & X_2 & X_3 & X_4 & X_5 & X_6 & X_7 \end{array} \\
\begin{array}{c} X_1 \\ X_2 \\ X_3 \\ X_4 \\ X_5 \\ X_6 \\ X_7 \end{array}
\left(
\begin{array}{ccccccc}
0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 0
\end{array}
\right)
\end{array}
\qquad (4)
$$

This cyclic structure of neural networks has for a previous history the circuits of neurons called cell-assemblies by Hebb [3] and is nowadays integrated in the corpus of Cognitive sciences.

2.3. The second order evolution and behavioral limits

The ideal case of the lowest entropy ($S = 0$) is slightly degraded in current lives, what explains the evolution of minds and cultures and the creativity of living beings: a 'nominal' way of thinking – characterized by a set of activated loops of neurons – is sometimes found the most probable behavior among many possible others, in a given situation, and these other behaviors can become nominal – or adapted – in new situations showing that new loops can be a better answer to the solicitation or the stimuli of a new environment. But neural plasticity is not infinite and loops, as numerous as they can probably be, give to the living beings their behavioral limits. The second order evolution must be understood as the one characterized by this plasticity while the first order considers the signal transmitted form neurons to neurons.

Furthermore a pure mind does not exist and neural loops must be open to physical sensations: a nervous cell as a chemoreceptor is not necessarily a link of a closed loop and a great deal of neurons can be parts of sensory or sensorimotor chains. These facts imply that the conditions (1) may be relaxed in phases during which stimuli must be injected into the nervous system. The purely closed loops model can be applied only during short times of nervous functioning and on the long term the sustainability of this model in a living body might lead to diseases like schizophrenia when one mind creates and maintains an 'internal' reality which does not rely on rational perception of the environment.

2.4. Mind-body problem and brain waves explanation

For ages philosophers have discussed the nature of the relation between mind and body a long time before sciences entered the debate with more practical considerations. Psychoanalysis has its own conception of the mind-body problem but like Philosophy, it kept it at an intellectual level, reorganizing [closed] loops as far as that can be until finding equilibria, the acceptance of internal and unconscious motives put into light by a long work of analysis.

But this problem has fundamental roots in the mythologies and religions that drove the world and imposed archetypes through representations of the origins of humankind in order to explain the strange relations between human acts and the spirits that motivate them. To some extent, these roots also feed moral values that provide guidelines for human beings when freedom of thinking has to be translated into choices of actions. This translation is fundamentally ethical but stay out of the control of a sole man: whatever his perception of a situation can be, he has only the part of the reality he built, neglecting more or less consciously values that do not fit his cultural environment or that nature did not give to him. So his decisions are a kind of bet after gathering incomplete and imperfect information in order to make them. The brainstorming corresponding to this phase of decision-making can be understood as periods during which the entropy of evolution of his neural network increases, while a kind of disorder prevails in his mind before he decides and so adopts a [closed] loops pattern.

Perceived psychological time is thus a succession of increases and zero settings of this entropy but the time based on these oscillations does not account for the primary order of activation of the neurons. The oscillations of S can be understood as the characterization of the origin of brain waves, due to the electromagnetic activity of the neurons, while these waves cannot be correlated with clearly determined individual nervous cells activity.

2.5. *Properties of the entropy of evolution and pathology*

As sets of neurons can be distinguished because of their participation in given functions or of their membership of a brain or body zone, S can be considered as an extensive state function and we should have:

$$S = \sum_l S_l \tag{5}$$

Where S_l is the entropy of evolution of a specific assembly of neurons, a subset of the global set of neurons. Thus the oscillations of S are differentiated according to its components S_l and brain waves can be located in observable – through an electroencephalogram or a magneto encephalogram – brain regions. The oscillations of S are in fact the 'superimposing' of variations of elementary evolution entropies and Science is still far from being able to explain the rules of this superimposing which involves interferences and other biophysical or biochemical phenomena and which creates brain waves of several frequency ranges (Beta, Alpha, Theta and Delta).

Considering the complexity of S, it seems clear that it has an absolute minimum, which is zero, but also a wide range of 'local' minima for instance when all the S_l are not at zero at the same 'time'.

As already addressed in a previous paragraph (§ The second order evolution and behavioural limits), the relative persistence of the activation – and so low-frequency waves – of a given loop (or assembly) of neurons may be the sign – the consequence or the origin – of diseases: several studies seem to confirm that "activity in low-frequency bands [slow waves associated with longer length of loops activation] in schizophrenic patients exceeds the activity of control subjects in distinct [brain] areas, and that this focal clustering of neuromagnetic slow waves may be related to psychopathologic characteristics" [4].

3. Extension of the closed model

The closed simple mind model is an oversimplified and very theoretical point of view although it constitutes a right means of dealing with the brain complexity or with a network of neurons in general. Closed loops of neurons, though abstract, characterize an intellectual effort to find an order and a historical coherence in a body in relation with its environment. This model can be extended along two areas of research: the first tends to generalize the closure conditions (1) in order to take into account the multiplicity of the

interconnections between neurons – one neuron can activate or inhibit several other neurons; and the second devotes the model and another extension to new ideas of Universe.

3.1. *Relaxation of the closure conditions*

As it has been made clear for taking into account receptors and effectors in nervous chains, the conditions (1) must be modified and become:

$$\forall j \sum_{i=1}^{N} \rho_{ij} = c_j\left(S\right), 0 \le c_j\left(S\right) \le N-1$$
$$\forall i \sum_{j=1}^{N} \rho_{ij} = r_i\left(S\right), 0 \le r_i\left(S\right) \le N-1$$

(6)

These new conditions account for the possibility for a neuron to activate more than two neurons, each of which being activated with a probability of 1 when S is at a minimum.

S_{max} is the maximum of S and it can be calculated, with e the Euler's number:

$$S_{\max} = \frac{N^2}{e} \quad \Rightarrow \quad r_i\left(S_{\max}\right) = c_j\left(S_{\max}\right) = \frac{N}{e} \, \forall i, j$$

(7)

But this theoretical maximum has no concrete meaning because of the very low values of real probabilities for some neurons to activate directly other distant neurons. So, considering N as the total number of neurons of the living body studied, it is highly probable that r_i and c_j are negligible in comparison with N, especially when S is at a minimum. Nevertheless the extension of the closed simple mind model through the conditions (6) allows for the functioning of real networks of neurons: one neuron can activate several other neurons at the 'same' time and S, as it has been defined, can still be at a minimum (local or absolute) characterizing entangled loops of neurons at given moments – the condition (3) still applies – instead of the distinct loops of the closed model. And more, the extension does not exclude that some neurons can be inhibited in spite of unit probability inputs from other neurons, or that neurons die. In the first case, the neuron k is fully inhibited if and only if:

$$\rho_{ik} \ne 0 \text{ *for some* } i \ne k \text{ *and* } r_k = 0$$

(8)

And in the second case, the neuron k dies if and only if:

$$\rho_{kj} = 0 \, \forall j \text{ *and* } \rho_{ik} = 0 \, \forall i \Leftrightarrow r_k = 0 \text{ *and* } c_k = 0$$

(9)

The death of a neuron implies, in concrete terms, a decrease of one unit in the dimension of the matrix ρ.

Nevertheless, the fundamental principle by which oscillations of S characterize the existence of brain waves is still good, even in the context of the relaxation of the closure conditions, and the closed simple mind model constitutes a kind of kernel of the mind-body problem. This kernel corresponds to the neural assemblies of least energy thanks to the minimization of the

number of activated loops. This principle of least action, which is common in Physics, applies to neural networks and leads to considering the kernel as a pattern of efficiency in operations and so, as a means of optimization thanks to the brain functioning. Out of the kernel, entangled loops can also make S minimal but require more energy, more activated connections, for this minimization. So pathologies, when the kernel is the place for slow oscillations of S, may appear as laziness [or energy saving], even if it is not a conscious choice of behaviour.

It is important to notice that the formal neuron [5] is not completely in agreement with the closed simple mind model which focuses on activations between neurons without considering thresholds or cumulative inputs necessary for these activations to be efficient. This apparent incompatibility is overcome by the relaxed conditions (6), the question being then: can the action be a characterization of the number of activated connections – synapses – between neurons, knowing that those connections can be activators or inhibitors and does the least action [principle] correspond to the smallest quantity of synapses which are put a strain on within loops of neurons? The speculative answer should be yes if the great majority of the connections were activation ones.

3.2. The interconnected Universe

In this paragraph, the hypothesis of the existence of God is made in order to 'embody' the physical phenomenon induced by the oscillations of the entropy of evolution of the Universe.

3.2.1. The discrete neural network model of the Universe

Accepting the idea that man could have been created in the own image of God, the closed mind model should be extended to a new conception of the Universe. Let us assume that only one divine particle is able to go from a state to another at a speed which has no limit. A state is supposed to be a set of properties – position, time, classical speed (the one of light is a maximum) and mass of the 'piece of matter' or of light (which mass is null), spin number, temperature, etc. – which can be also infinite and sufficient to describe any component of the Universe – matter, antimatter, dark matter, light, etc. These states are represented like the neurons of the simple mind model but their number N is now much greater. The probability for the divine particle to go from the state X_i to the state X_j is still ρ_{ij}. The conditions (1) may apply and the entropy of evolution is defined as S. Before any 'decision' of God, all transitions between any two different states could be possible and S could be huge. But God decided to create the Universe – we all are evidences of this creation – and the entropy of evolution was set to zero – or in the neighbourhood of zero. Loops of states then appeared while the divine particle was multiplied – one instance in each loop – to respect the ubiquity of God. Nevertheless, mathematically, there could be a sole giant loop and so only one divine particle 'illuminating' the

Universe from the past to the future according to the human perception of time. The image of the functioning of a cathode-ray tube may help to imagine this concept of Universe: the electron beam of a cathode television set moves so fast that the lines it creates on the screen are seen as pictures of which the succession gives the impression of real characters or setting evolution. The divine particle is so, moving from state to state at an infinite speed and creating a Universe in evolution. What has been named 'state' previously can be considered as a set of quantified properties associated with a 'neuron' of God and like for a classical neuron this set can change according to the activations and to the cycle of *S*.

Then as the Universe is an infinite series of evolutions – or cycles of 'destructions' and creations of loops of states associated with the divine particle – it is necessary to consider that *S* oscillates and that these oscillations create waves of any kinds: electromagnetic, gravitational, mechanical, but also waves of matter, etc. while the neurons of God materialize corpuscles. The classical example of the creation of electromagnetic waves by the oscillations of electrons can illustrate locally the global phenomena induced by the oscillations of *S*. The simple mind model is thus a means of explaining, when adapted to the Universe, the physical wave-corpuscle duality.

The 'hypothesis' of God might seem irrelevant in the context of a scientific research but the relaxation of the closure conditions leads to considering more than one universe whereas the notion of neuron or state is invariant, whatever the number of potential universes: the number of neurons stays the same and only the quantity of connections changes. So there is a real need for 'something' invariant – at least a set of neurons or states – accounting for the potential existence of a multitude of universes.

3.2.2. The continuous neural network model of Universe

Furthermore the discrete model should also be extended to a continuous one in which each 'state' is X_x and the probability of transition from X_x to X_y is then $\rho(x,y)$, where x and y are real numbers. The conditions (1) become:

$$\forall y, \int_{-\infty}^{+\infty} \rho(x, y)\, dx = c(y)$$
$$\forall x, \int_{-\infty}^{+\infty} \rho(x, y)\, dy = r(x) \tag{10}$$

And the entropy of evolution is written (*cm* for 'continuous model'), but not always defined:

$$S_{cm} = -\int_{-\infty}^{+\infty}\int_{-\infty}^{+\infty} \rho(x, y) \ln \rho(x, y)\, dx\, dy \tag{11}$$

S_{cm} is defined and at its minimum if:

$$\forall x, y \; \rho(x, y) = 1 \; or \; \rho(x, y) = 0 \tag{12}$$

When $S_{cm} = 0$, the unicity of the transition from one neuron to another, which is verified in the closed simple mind model, is no longer guaranteed by the conditions (10).

These conditions (10) are only defined when $\rho(x,y)$ is continuous and in this case the integrals $c(y)$ and $r(x)$ converge – out of the trivial situation in which $\rho(x,y)$ is null – if and only if $\rho(x,y)$ is not null on a finite number of [closed] balls (in two dimensions) and null elsewhere.

If $\rho(x,y)$ is not continuous except when it is null, $c(y)$ and $r(x)$ are defined if and only if $\rho(x,y)$ is null except on a finite set of y's (respectively of x's) and then $c(y)$ and $r(x)$ are null.

Particularly, it can be assumed that (12) is satisfied and $c(y) = r(x) = 0$ with:

$$\forall y, A(y) = \left\{ a(y) / \rho(a(y), y) = 1 \right\} and \ \forall x \notin A(y), \rho(x, y) = 0$$
$$\forall x, B(x) = \left\{ b(x) / \rho(x, b(x)) = 1 \right\} and \ \forall y \notin B(x), \rho(x, y) = 0$$
(13)

If $A(y)$ and $B(x)$ are finite sets of real numbers, the conditions (10) and S_{cm} are well defined and $S_{cm} = 0$. But if $A(y)$ and $B(x)$ are neither empty nor singletons, there can be a great deal of transitions – or effective connections – between neurons and so a wide range of entangled loops and a multitude of universes based on the same infinite set of neurons or states.

Out of this particular case which induces $S_{cm} = 0$, S_{cm} is not clearly mathematically defined but considering the hypothetical reordering of the numbering of the neurons in order to get a continuously non null $\rho(x,y)$, it would be clear that S_{cm} should diverge. So intuitively, a 'S_{cm}-like' sum can also oscillate between a maximum – which can be infinite – and zero.

3.3. Multiple universes, kernel and God's will

This behaviour can be compared with the results presented in the case of the relaxation of the simple mind model conditions (1). The principle of a kernel based on these original conditions – and so on the least action principle – enables to consider a unique and closed Universe in which slow waves are the sign of pathologies whereas relaxation creates entanglement of multiple 'points of view'.

Thus the continuous model leads to the idea that there is a multitude of parallel universes and that each of them may interfere with the others when S oscillates. This idea is new neither in Philosophy nor for physicists [6, 7]. Nonetheless this hypothesis is now fully compatible with the existence of God as the master of the potentially infinite number of probable universes. The question should then be: can God impose a will on that multitude or is (S)He only the One who enacts the laws that humankind discovers and on which Man founded his religions, his cultures and his sciences?

In order to answer this question, it is necessary to discover what is common between religions and sciences due to the human nature and what can explain that mankind could be conscious of the existence of a Supreme Being beyond any cultural or scientific boundaries.

4. Transference theory

In psychoanalysis transference is roughly a transfer of feelings from one person to another one. A scientific analysis would lead to identifying a fundamental and objective need founding what could be a feeling. Beyond any taboos, a need can be expressed in functional terms as through engineering tools like value analysis [8]. The aim of this paper is not to claim the discovery of a science of feelings but simply to find what can distinguish functional performance from subjective satisfaction. Thus at a given time, needs can be covered and then satisfied by a set [of outputs] of functions or actions. But according to the evolution of life, from birth to death, and of any successive environments – economic, technical, physical, etc. – this set of functions also evolves to keep up with the satisfaction pattern of the needs and as time passes, this pattern may be transferred from the previous set to a new one: this is the case when one moves in a new home or changes car. The mechanism is almost the same at work: one set of functions must be performed to gain a professional success but the transference is needed a smooth way in everyday life in order to maintain one's position or sometimes toughly when one has to change from an employment to another.

4.1. Cognitive cycle

Thus here, transference is a kind of projection of a functionally structured idea on a matter in order to work on it or to get a physical advantage, not to say profit, from it. This materialistic point of view shows how human beings adapt to their environment through a mind empowered capability and gives a way to make one's talents yield a profit.

That projection has for a trigger an event in relation with the environment, a change in one's life or the will of an authority. The mechanism is simple. It begins in a first stage as an established way of life characterized by a neural network with minimal entropy of evolution: each loop of neurons can then be considered as a function and all the loops define a set of functions that are the internal expression of the relation between the network and its environment. The beginning of the cognitive cycle is the end of a previous one and shows the mental projection of the functions set onto what is called reality. This projection is a phase of experimentation – the confrontation of an abstract functional model or pattern with a set of contextual information – which is followed by the second stage of the cycle: the observation that comes with an increase in the entropy because of the challenge to fill the gap between the initial functional representation and the perceived reality. This second phase suspends judgment during which the neural network gets reorganized before a new minimization of the entropy corresponding to the third and last stage of the cognitive cycle: the creation of another adapted functional interpretation of the environment in relation with the network. This interpretation is the opportunity for the

emergence of a historical meaning, that is to say the development of an ideology or a theory that will itself call for experimentation.

4.2. *Psychoanalytic and general principles*

The simplest Lacanian psychoanalytic system [9] – composed of the real, the symbolic and the imagination – can be 'unrolled' along the three phases of transference: the imagination is the current set of activated functions – S minimal – and is projected against the environment to realize the experimental phase; then the mind wakes up to the real – S increases – and the language, the symbolic, structures the interpretation that comes with the creation of a new set of functions – S is back to a minimum. The cognitive cycle also applies to the second topics Freudian system [10]: the id is a set of emerging elements of the imagination; the superego is the integration of external principles or values – the real – in the subject's mind and the ego is the permanent instance of verbalization – in the symbolic 'space' of the language – concomitantly with the stabilization of an internal conception of the present time.

As defined previously, the transference is a set of general principles that apply to many kinds of phenomena because it is the fundament of the dynamics of thinking in interaction with an environment, whatever this one can be. Its three stages have a clear spiritual resonance especially when a community of souls experiences it in the same time and on the same 'matter'. The dynamics of a group of people gathered for a common purpose – a conference, a lecture or a religious service – reinforces the individual convictions although the projection can be different in nature for each member of the group: fundamentally, a religious or even a laic 'Communion' has for a consequence a time of common life with a unique pace, the community experiencing the same phenomenon, the one of the transference guided by an authority or a common faith.

4.3. *Model driven religious application*

But it can be established that the transference theory has for a previous history more than two thousand years of Theology and Science.

In Christianity, Jesus is the Son of God but in the New Testament He is also considered as the Son of Man. This duality characterizes the impetus of the Christians from their human nature to the Lord, the Almighty and omniscient Father. This impetus is imagination and sustained by the faith, a means of keeping one's mind in the idea of God: when it is successful, it leads to sublimation; it is the noble part of the id, the most creative one. So the imagination of the Lacanian system or the id of the Freudian second topics can find a religious equivalent in the 'concept' of Son.

As God is [in] everything, the world or the Universe emanate from – or have been created by – the Father who is thus the real, the unrealizable truth. But this Father is also the merciful Judge and to a large extent (S)He represents the superego because a religion imposes social norms and laws in the name of God.

The third hypostasis of the Trinity is the Holy Spirit who spreads over the world thanks to the Word of God. (S)He is highly symbolic and, structured by the language, (S)He has all the attributes of the ego.

It could be possible to reorganize the psychoanalytic systems according to new interpretations of the Holy Trinity. But whatever such reorganizations could be, as according to early Judaism the true name of God cannot be pronounced, the Father cannot be reached at a symbolic level, the one of the language and of the expression of the ego and (S)He can neither be imagination because as the Creator (S)He is the most concrete Being. This does not exclude that there might be confusion between the Son and the Holy Ghost: could the latter be imagination or id and could the former be symbolic or ego? The Holy Spirit is considered as the 'mind' of God which drives the prophets, the Messiah – or the Son – or every believer, to act. But this incitement is structured by the Word of God revealed to them, what develops their imagination: the right imagination cannot come before the revelation. So the Holy Spirit is truly symbolic.

Thus the transference interpreted in terms of religious hypostasis can be described through the following cycle: in the beginning was the Word from a previous cycle, then the prophet or the Messiah driven by the Word – or the Word made flesh – elaborates (*S* is minimal) his imagination – as the Son – that is supposed to uncover (*S* increases) the Truth of the Father, the Eternal. The true Will of God is then revealed through the [Holy Ghost's] Scriptures (*S* minimized) and the Word by the Son who ends the cycle and begins the following.

This religious digression should be understood in taking account of the spiritual issue brought to light by the idea of a possible neural network at a universal level. It is proposed here only to illustrate the fact that there are conceptual equivalences between Science, psychoanalysis and the Christian Trinity – and maybe also the Hindu triad of Brahma, Vishnu and Shiva – according to cognitive principles supported by a probability driven neural network model and by mathematical tools. These cognitive regularities are only outlined and could certainly encompass more numerous concepts and systems of thoughts. Furthermore, it can be supposed that the entropy of evolution, computed on the Meta system of neurons of the whole humankind, oscillates according to the will of God and that humanity, as a part of the Universe, has its own wave pattern, a too complicated one for nowadays human beings but a simple matter of 'consciousness' for the 'nameless Spirit'.

5. The cornerstone of ethics

When someone speaks about 'ethics', the great majority of listeners think 'morality' and associate both terms, one with the other, as being the main topic that considers the good and the bad. It is not a real mistake but a lack of discernment or of culture.

Actually, morality relies on moral standards which apply to a group of people, a society, a nation or a civilization. These standards are not monolithic: they have been established according to various ways of thinking inherited from necessary and sometimes best practices which have been kept as cultural assets giving to those who share them a real advantage in the evolution of their group in comparison with other groups. These practices are sometimes concretely engraved like on the Tables of the Law, others are written in constitutions or elevated to a universal status, like the Declaration of Human Rights, but a great deal of them are still implicit until they are turned into laws when the stability of a society is concerned and when ideas of Justice must be clarified after being debated by the legislative bodies. Thus morality is essentially a matter of religion or policy. And it tends to be 'universal': it has for ambition to fix the behaviour of everyone on rules that go for everybody.

Ethics is a more personal set of rules defined and used by an individual as strategies that must be applied to reach an aim while others are using their own rules for reaching their own aims which can be the same. This is not a definition nor a general rule but a rough and operational observation. An application or an abuse of Socrates' way of thinking is that there cannot be totally ethical behaviours: either an individual follows his rules without knowing all the consequences of the actions resulting from the use of these rules, and so he is unethical because of his ignorance – and this is the case of most of us; or he breaks his own rules and he is clearly unethical. But what can be said if his rules are unethical or in other terms, if one of those rules goes against the others in some circumstances? Paradoxically this case is not the worst because it raises questions about the coherence of systems of belief and makes way for doubt and necessity of judgement and free will. So when it is possible to find exceptions to ethical rules or when their application 'depend on' the situation then a real ethics can be founded for action, after, and not only for, reflection.

In that context the ethical conversion is an attitude consisting in freeing oneself from dogmas, social moralities but also from calculations of interests in order to make a focus on the link between oneself and the world, that is to say on the action. Ethics is actually interested in action, in the behaviours of individuals in relation with themselves, with the others and their environment in general.

In the system of thinking of this article, moral standards are considered as the [heteronomous] superego of the Freud's second topics, while the id corresponds to the individual's use of rules of ethics and the ego is characterized by the ethical conversion.

Thus the ethical cycle, so often used, can be decomposed in three steps: the first one, when the individual organizes his mind according to ethical principles or rules, *S* is at a minimum; the second step, when the individual projects his rules in or on the moral standards of his environment, *S* grows to a maximum and the third step consists in the adoption of new operational or ethical pattern and behaviour in action, *S* is back to a minimum. The second step induces becoming aware of the gap between the political or religious order – the moral standards – perceived as unchanging and what this order could be and

more, what it would be if each individual applied his or her rules. That leads to the last step of the cycle which is consciousness of making a decision, imperfect compared with the highest moral standards, but necessary for a profitable action in order not to be left on the fringe of a society.

This article is truly ethical in its structure, following the three-stage cycle: at first the individual's brain model – the ethics rules embedded in it, then [second stage] an attempt towards universality – like morality tends to be 'universal' – through the Supreme Being's neural model and [third stage] the description of a new way of conceiving the relation of Man with his environment through the transference theory and its multiple applications still coherent with a cyclic pattern from cognition and psychoanalysis – foundations of ethics – to religions – main foundations of morality – and then to ethical action.

6. Results and discussion

6.1. Science and Supreme Being

The systematic approach enabled by neural networks which applies to the technological evolution of systems, finds original roots in a more general scientific method based on the triptych experimentation-observation-interpretation, the interpretation being an opportunity to develop a theory that will have to be confronted with the results of further experimentation according to a cycle. This cycle is also cognitive, psychological and spiritual. Thanks to the progress of generations of researchers in very diverse fields it has enabled to reach a higher level of consciousness, as it could have been said at any period of the past without the knowledge of the future. Interpretation always gives the 'taste' of the present time to any understanding of phenomena, so a theory can be rephrased according to this taste without changing at a basic level. Thus the evolution analysed through the triptych might be identified as a scientific regularity; and more, it brings to light a new concept of universe highly compatible with the existence of God as the Supreme Being who creates and recreates at an infinitely fast pace the wholeness of what man can perceive, calculate, imagine… and beyond. These successive creations and recreations cause the oscillations of the entropy of evolution of the universe what gives birth to waves while states of 'matter' are activated and can be perceived as corpuscles or more organized sets of objects or beings. This explanation of the wave-corpuscle duality has no equivalence in science and is not comprehensible without questioning the existence of a supreme life form that would govern the Universe(s).

6.2. Two orders for understanding natural neural networks

The basic nature of networks of neurons is discrete and their constituents still defy any scientific modelling, what justifies the probabilistic description which allows simultaneously dealing with the first and the second order

evolutions. Incidentally these two orders are generally far from being taken into account by artificial neural networks: neuronal and synapses plasticity – second order – is a property of living bodies' networks of neurons and the transmission of signals through synapses for the activation of a neuron by another one – first order – cannot be rigorously modelled with all the complexity of life. Both orders can be more accurately qualified as structural for the first one while the second one is perceived as a performance related to an ever changing environment and as proposed by [8], the quantum uncertainty relations of Heisenberg apply through an analogy: "the precise knowledge of the structure leads to a statistical dispersion on the simultaneous knowledge of the performance and vice versa", where the structure is a set of activated functions. But in the framework of neurology, between the brain structure consisting of neurons and synapses, and the principle of performance relying on plasticity and adaptive utility, there are brain areas and functions: thus it is appropriate to distinguish two levels of functions, the first one embedded in the nervous system and brain structure – the functions materialized by loops of neurons – and the second one found through the activity symbolized by the variation of the entropy of evolution – transitional functions – characterizing the plasticity and adaptive efficiency of a network of neurons delivering then a performance. Eventually the functional approach associated with the transference principle is a means of building an ordered consciousness of the relations between such a network and its environment, and through the order, which is a necessary and temporary illusion, decision-making is possible according to a relative rationality while avoiding the uncertainty derived from the lack of decision or an existential doubt.

7. Conclusions

This relative rationality is to science what ethics is to moral standards. Both rationality and ethics rely on choices within a system of belief and on methods or behavioural rules which enable to choose either a hypothesis on which a researcher can build a theory and the way how to prove it through experiments, or temporary and shared prejudices from which constructivism infers the relation of an individual with his or her environment and the way how to behave well in a given society.

Freedom of Science is an illusion made of discipline, by school and academic stamps at first and then by other institutional influences. And woe to that layman who decided to create his or her own field of research! At best (s)he will rediscover – or will be said to do so – what others have already structured by brilliant books or articles but generally (s)he will be left outside the main streams of knowledge, considered as a dropout, working in the margins of existing sciences but incapable of integrating the basic requirements of a sole science. Unless (s)he has already been recognized by his peers for previous academic works, he will be excluded from any network of researchers. As a business, science is one of the most unrewarding, maybe because it is also the

one which brings the best satisfactions through the simple fact of working on it. For those reasons the model of universe proposed in this article is worth being reflected upon as a means of satisfying creationists in placing God as the creator of the Universe. But this model is also compatible with the evolutionist point of view because (S)He is Himself subject of evolution in spite of the permanence of His fundamental being. The fact that His evolution could be made through the choice of one universe among many probable universes implies that this model is eminently ethical, ethics being a matter of choice of action for a given context of decision making.

Freedom of speech and mind has also its own case of exclusion. As a symbol, the example of Socrates is the most striking for its ethical implications. Condemned to death for simply questioning the beliefs of his contemporaries, the great philosopher was only involved in his own logical counter-constructivist method that was also an ethical inquiry, looking for fundamental truths that could be proven beyond any prejudice. In other times the Inquisition founded its justice on religious certainties and it was not then a question of mere exclusion.

Mind-body problem has long been a core questioning of the ethical nature of human beings and can still appear in an intentionality-centred analysis. According to Descartes' "cogito ergo sum" [11] – I think therefore I am – this problem seemed purely intellectual whereas the vast majority of people only think they are when they feel themselves in action and when their action implies choices especially under risks or uncertainty. Those risks can be physical but generally they are affective, the essential being just not to disappoint someone who counts or not to be caught telling lies, losing one's self-control or self-esteem. This ethical aspect of intentionality betraying deeper intentions or feelings makes of life the equilibrium that is to be found, far more important than any attempt to generalize ideas based on models although truth might be richer when it goes through generalization and great principles of [least] action.

Such equilibrium obtained through the mind-body unity freed from any Freudian slip or other 'acte manqué' characterizes the high integrity of a consistent personality whose ethics is in accordance with moral feelings that tend to make somebody's mind universal. Transposed to a Supreme Being this unity enables Science to go beyond any duality in order to reach the uniqueness of a formalism which gives a new meaning to universality.

References

[1] B. Pascal, *Pensées*, Gallimard, Paris, 1977, 87.
[2] Plato, *Republic*, Hackett, Indianapolis, 1992, 186-212.
[3] D. Hebb, *The organization of behavior: a neuropsychological theory*, Wiley, New York, 1949.
[4] T. Fehr, J. Kissler, S. Moratti, C. Wienbruch, B. Rockstroh and T. Elbert, Biol. Psychiat., **50** (2001) 108-116.
[5] W.S. McCulloch and W. Pitts, B. Math. Biophys., **5** (1943) 115-133.
[6] H. Everett III, Rev. Mod. Phys., **29** (1957) 454-462.
[7] J. Wheeler, Rev. Mod. Phys., **29** (1957) 463-465.

[8]   E. Chauvet, J. Bus. Ethics, **113** (2013) 395-413.
[9]   J. Lacan, *Des-Noms-du-Père*, Editions du Seuil, Paris, 2005, 13-24.
[10] S. Freud, *An Outline of Psycho-Analysis*, W.W. Norton & Company, New York, 1989, 13-16, 81-98.
[11] R. Descartes, *Discourse on Method and Meditations on First Philosophy*, 4th edn., Hackett Publishing, Indianapolis, 1998, 18-22.