Elaboration of the Algebra of Consciousness.

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Abstract: In a previous paper we have given the basic quantum mechanical foundations of quantum mechanics elaborated by using the Clifford algebra and giving identification that such algebra may represent an algebraic representation of our consciousness. In this second section we give detailed elaboration of this algebra discussing its basic features relating our consciousness.

In a previous paper we have recently provided to identify the algebra of the consciousness. The aim of the present paper is to formalize such algebra.

We have to premise that in such our formalization we are inspired from two important authors who are V. A. Lefebvre and Goertzel, Aam, Smith, Palmer [1,2]

1) First of all we assume the existence of an abstract entity that we call the Mind Entity. As a system it has the property to exist in different states that we call mental states .

2) The peculiar feature of mind entities is that to the extent that they are neuropsychological systems, they may be viewed as agents that mirror itself in itself and the outside in itself. They are self-referential entities.

3) In detail : Call the entity A and the outside B .Mirroring mind entity A means that the mind entity A has an image of A (self-image) and a proper and peculiar A- image of the outside B.

4) The other feature that we introduce is that such abstract mind identity may be represented by the three basic elements of the Clifford algebra that we have previously discussed [3].

The aim of our elaboration is to evidence the role of quantum mechanics in analysis of such entity and its states.

Our pattern is evident: by using Clifford algebra, we realize a rough bare bone skeleton of quantum mechanics. Mental entities are members of Clifford algebra. On this line we evidence the particular role of quantum mechanics to be intended as a “physical theory” of mental entities.

In the previous paper, [1] we recalled some basic our foundations of Clifford algebra but it is obvious that, when attempting to consider a more complex system of mirroring entities , as previously admitted by us as a postulate, we are forced to recall the Clifford algebra at higher order of complexity, that is to say at order n = 4, …… .

Let us consider the system of a mirroring entity. As said it must have the self-image of itself and a self image of the outside. In order to be clear, let us recall the notions that we previously exposed in [1].

Let us expand our algebraic formulation introducing the Clifford algebra at any order n.

First consider Clifford $A(Si)$ algebra at order n=4 . One has

$$E_{0\,i} = I \otimes e_i; \qquad E_{i\,0} = e_i \otimes I$$

The notation ⊗ denotes direct product of matrices, and I is the unit matrix. Thus, in the case of $n=4$ we have two distinct sets of Clifford basic unities, $E_{0\,i}$ and $E_{i\,0}$, with

$$E_{0i}^2 = 1 \;; \qquad E_{i0}^2 = 1, \qquad i = 1, 2, 3;$$

$$E_{0\,i}E_{0\,j} = i\,E_{0\,k}\,; \qquad E_{i\,0}E_{j\,0} = i\,E_{k\,0}\;, \qquad j = 1, 2, 3; \qquad i \neq j$$

and

$$E_{i0}\,E_{0\,j} = E_{0\,j}\,E_{i\,0}$$

with (i, j, k) cyclic permutation of $(1, 2, 3)$.

Let us examine also the basic following result

$$(I^1 \otimes e_i)\,(e_j \otimes I^2) = E_{0\,i}\,E_{j\,0} = E_{j\,i}$$

It is obtained according to our basic rule on cyclic permutation required for Clifford basic unities. We have that $E_{0\,i}E_{j0} = E_{j\,i}$ with $i = 1, 2, 3$ and $j=1, 2, 3,$ with $E^2_{j\,i} = 1,$ $E_{i\,j}E_{k\,m} \neq E_{k\,m}E_{i\,j}$, and

$E_{i\,j}E_{k\,m} = E_{p\,q}$ where p results from the cyclic permutation (i, k, p) of $(1, 2, 3)$ and q results from the cyclic permutation (j, m, q) of $(1, 2, 3)$.

In the case $n = 4$ we have two distinct basic set of unities $E_{0\,i}$, $E_{i\,0}$ and, in addition, basic sets of unities $(E_{i\,j}, E_{i\,p}, E_{0\,m})$ with (j, p, m) basic permutation of $(1, 2, 3)$.

This is the Clifford algebra A at order n=4.

In the other more general cases we have $E_{0\,0\,i}$, $E_{0\,i\,0}$, and $E_{i\,0\,0}$, $i = 1, 2, 3$ and

$$E_{0\,0\,i} = I^1 \otimes I^1 \otimes e_i\,; \quad E_{0\,i0} = I^2 \otimes e_i \otimes I^2; \qquad E_{i\,0\,0} = e_i \otimes I^3 \otimes I^3$$

and

$$(I^1 \otimes I^1 \otimes e_i) \cdot (I^2 \otimes e_i \otimes I^2) \cdot (e_i \otimes I^3 \otimes I^3) = e_i \otimes e_i \otimes e_i =$$

$$= E_{0\,0\,i}\,E_{0\,i\,0}\;\;E_{i\,0\,0} = E_{\,i\,i\,i}$$

Still we will have that

$E_{0\,0\,i}\, E_{0\,i\,0} = E_{0\,i\,0}\ \ E_{i\,0\,0}$; $E_{0\,0\,i} E_{i\,0\,0} = E_{i\,0\,0} E_{0\,0\,i}$; $E_{0\,i\,0}\, E_{i\,0\,0} = E_{i\,0\,0} E_{0\ i0}$

Generally speaking, fixed the order n of the $A(Si)$ Clifford algebra in consideration, we have that

$$\Gamma_1 = \Lambda_n$$

$$\Gamma_{2m} = \Lambda_{n-m} \otimes e_2^{(n-m+1)} \otimes I^{(n-m+2)} \otimes \ldots\ldots\ldots \otimes I^n$$

$$\Gamma_{2m+1} = \Lambda_{n-m} \otimes e_3^{(n-m+1)} \otimes I^{(n-m+2)} \otimes \ldots\ldots\ldots \otimes I^n$$

$$\Gamma_{2n} = e_2 \otimes I^{(2)} \otimes \ldots\ldots\ldots \otimes I^n$$

with

$\Lambda_n = e_1^{(1)} \otimes e_1^{(2)} \otimes \ldots\ldots \otimes e_1^{(n)} = (e_1 \otimes I^{(1)} \otimes \ldots\ldots \otimes I^n)\cdot(\ldots\ldots\ldots)\cdot(I^{(1)} \otimes I^{(2)} \ldots \otimes I^{(n)} \otimes e_1)$;

$m = 1, \ldots\ldots, n-1$

according to the n-possible dispositions of e_1 and I in the distinct direct matrix products.

We may now give the explicit expressions of $E_{0\,i}$, $E_{i\,0}$, and $E_{i\,j}$ at the order n=4.

$$E_{01} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix};\ E_{02} = \begin{pmatrix} 0 & -i & 0 & 0 \\ i & 0 & 0 & 0 \\ 0 & 0 & 0 & -i \\ 0 & 0 & i & 0 \end{pmatrix};\ E_{03} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$$

$$E_{10} = \begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix};\ E_{20} = \begin{pmatrix} 0 & 0 & -i & 0 \\ 0 & 0 & 0 & -i \\ i & 0 & 0 & 0 \\ 0 & i & 0 & 0 \end{pmatrix};\ E_{30} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix};$$

$$E_{11} = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix};\ E_{22} = \begin{pmatrix} 0 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ -1 & 0 & 0 & 0 \end{pmatrix};\ E_{33} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix};$$

$$E_{12}=\begin{pmatrix}0&0&0&-i\\0&0&i&0\\0&-i&0&0\\i&0&0&0\end{pmatrix};E_{13}=\begin{pmatrix}0&0&1&0\\0&0&0&-1\\1&0&0&0\\0&-1&0&0\end{pmatrix};E_{21}=\begin{pmatrix}0&0&0&-i\\0&0&-i&0\\0&i&0&0\\i&0&0&0\end{pmatrix};$$

$$E_{31}=\begin{pmatrix}0&1&0&0\\1&0&0&0\\0&0&0&-1\\0&0&-1&0\end{pmatrix};E_{23}=\begin{pmatrix}0&0&-i&0\\0&0&0&i\\i&0&0&0\\0&-i&0&0\end{pmatrix};E_{32}=\begin{pmatrix}0&-i&0&0\\i&0&0&0\\0&0&0&i\\0&0&-i&0\end{pmatrix}.$$

Note the following basic feature: we have now some different sets of Clifford algebras $A(Si)$. In detail, we have the following sets of basic $A(Si)$ Clifford algebras:

$(E_{01},E_{12},E_{13}),(E_{01},E_{22},E_{23}),(E_{01},E_{32},E_{33}),(E_{02},E_{11},E_{13}),$ $(E_{02},E_{21},E_{23}),(E_{02},E_{31},E_{33}),$ $(E_{03},E_{11},E_{12}),(E_{03},E_{21},E_{22}),(E_{03},E_{31},E_{32}),(E_{10},E_{23},E_{33}),(E_{10},E_{22},E_{32}),$ $(E_{10},E_{21},E_{31}),$

$(E_{20},E_{13},E_{33}),(E_{20},E_{12},E_{32}),(E_{20},E_{11},E_{31}),$ $(E_{30},E_{13},E_{23}),(E_{30},E_{12},E_{22}),(E_{30},E_{11},E_{21})$

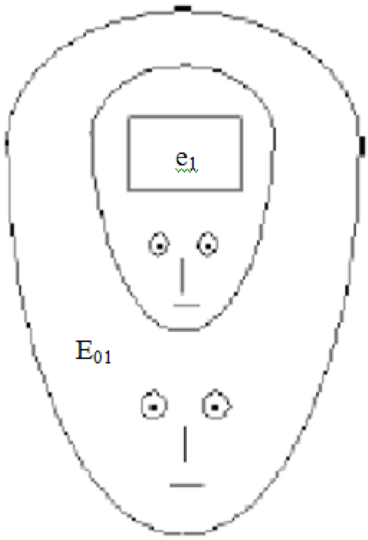
To each of these sets we may apply the theorems n.1 and n.2 previously shown in [1], and we may also apply the criterium of the passage from the $A(Si)$ to the $N_{1,\pm 1}$ that we have just used in the other previous cases of application [3]

Fixed such algebraic features, consider the case of two mirroring entities.
We will have to use the case n=4.
The basic Clifford algebraic structures will be

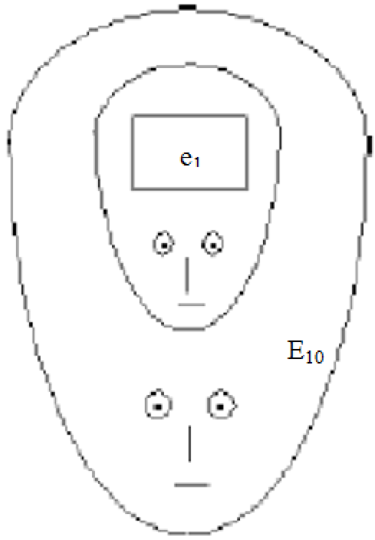
$E_{0i}=I^1\otimes e_i;$
and
$E_{i0}=e_i\otimes I^2$

so that the first set E_{01}, E_{02}, and E_{03} will relate the first mirroring situation.
and the set E_{10}, E_{20}, and E_{30} will relate the second mirroring situation
All the basic mirroring structures will be represented by the basic Clifford sets $(E_{01},E_{12},E_{13}),(E_{01},E_{22},E_{23}),(E_{01},E_{32},E_{33}),(E_{02},E_{11},E_{13}),$ $(E_{02},E_{21},E_{23}),(E_{02},E_{31},E_{33}),$ $(E_{03},E_{11},E_{12}),$ $(E_{03},E_{21},E_{22}),(E_{03},E_{31},E_{32}),(E_{10},E_{23},E_{33}),(E_{10},E_{22},E_{32}),$ $(E_{10},E_{21},E_{31}),(E_{20},E_{13},E_{33}),(E_{20},E_{12},E_{32}),(E_{20},E_{11},E_{31}),$ $(E_{30},E_{13},E_{23}),(E_{30},E_{12},E_{22}),(E_{30},E_{11},E_{21}),$ $(E_{01},E_{02},E_{03}),,(E_{10},E_{20},E_{30})$. They define a space Clifford algebra that we cal the space of our mind entity.
Note as such structure runs.
Consider the couple (E_{01}, E_{10}).
Representing by a basic graph , we have

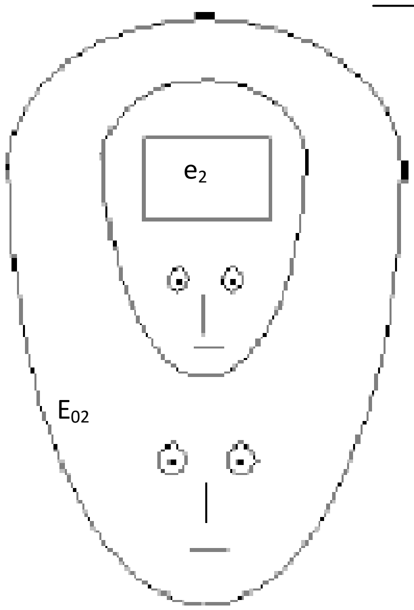
First mirroring structure

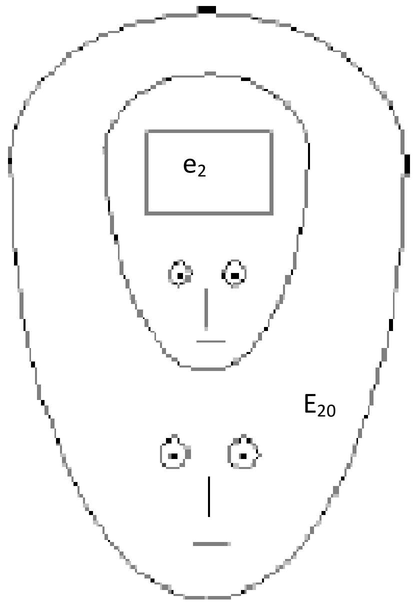


Second mirroring structure

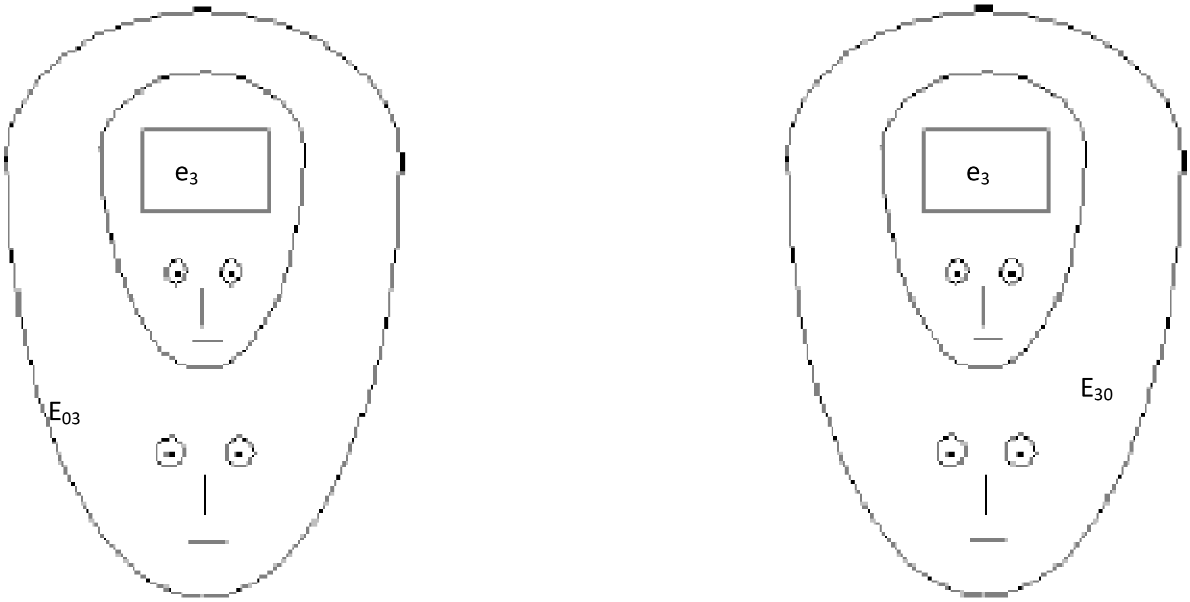


Consider now the couple (E_{02}, E_{20}) : we will have





Consider the couple (E_{03}, E_{30}) : we will have



Note that for each select basic element e_1, e_2, e_3, the two mirror selected structures contain the self-referential mirror images. E_{0i} $(i = 1,2,3)$ relates A to itself (A); E_{i0} relates the outside B to A (self-image image of B in A). Both, E_{0i} and E_{i0} contain self image of e_1.

Note that, in order to construct E_{0i} and E_{i0}, we have used the two basic operations

$$E_{0\,i} = I \otimes e_i; \qquad E_{i\,0} = e_i \otimes I$$

where e_i is the basic mind entity that we have admitted and I is the basic outside entity so that E_{0i} represents the self mirror image (self image) of itself while E_{i0} represents the self-mirror image in itself of the outside that is represented by I.

We have realized the first algebraic, quantum mechanical representation of the basic mental entities e_i having self-awareness, self-referential.

The important conclusion that cannot escape to the attention of the reader, is that all such basic Clifford elements have their counterpart in the bare bone skeleton of quantum mechanics and thus, in conclusion, we are giving a quantum mechanical algebraic formulation of such self-referential two mirroring mind structure as pertaining directly to quantum mechanics.

In detail, we may apply to such scheme of mirroring structures, the basic foundations of quantum mechanics as we explained in [3]. They represent basic entities of our mind that support as example the first basic quantum mechanical principle, the ontological principle of potentiality that we exposed in the previous publication, [3]. They still support the vision of irreducible indeterminism and of consequently quantum probabilistic approach. It arises a picture in which the dominant features of the mind structure are the quantum probability field, the intrinsic indetermination, the potentiality and the superposition of possible potential states. Such mind structure supports the principle the ambivalence, and the condition of doubt, and of conflict that arise , as we know, characterizing any human mind entity.

E_{01}, as example, has, first of all, self-awareness and, in addition, the intrinsic irreducible potentiality to assume one of the two possible values, or +1 or -1, each given with a certain probability, here intended as expression of irreducible indetermination of each mirroring structure that we have. The probabilities $p(E_{01}=+1)$ and $p(E_{01}=-1)$ will characterize the probability field that in abstract is causally responsible in determining the dynamics of the mind, the potentiality to assume simultaneously the values (± 1) will characterize the intrinsic ambivalence, as well as the difference

$p(E_{01}=+1)$ - $p(E_{01}=-1)$, will characterize the condition of doubt, of inner conflict, of uncertainty in its inner dynamics

The same thing happens obviously for each of the Clifford basic elements E_{0i} and E_{i0}. In brief , again we have here a quantum probability field, that , as we explained in detail in [1], represents a basis net that superintends to the inner dynamics of our mind .

Consider the first mirroring structure. It will be represented in our rough bare bone skeleton of quantum mechanics, given by the Clifford algebra, by the basic set (E_{01}, E_{02}, E_{03}): to it we are free to apply all the quantum mechanical formulation .

Consider now the second mirroring structure. It will be represented in our rough bare bone skeleton of quantum mechanics, given by the Clifford algebra, by the basic set (E_{10}, E_{20}, E_{30}): to it we are free to apply all the quantum mechanical formulation. In particular we are free to apply to such two basic Clifford sets the two theorems formulated in $A(S_i)$ and $N_{i,\pm 1}$.This is by itself sufficient to give a quantum mechanical characterization.

However, we have to explain in detail here how the mirroring operation is realized by such two structures.

It remains to express the concept of existing alternatives. Certainly in the scheme of our ordinary every day experience we never find a traffic light that is simultaneously red and green. The two alternatives do not exist at this level of our experience. In the space of our cognitive dynamics we have instead their coexisting dynamics. Consider the case of a subject who is under a lawsuit by a false accusation. At some stage of the process he has the possibility to present a storage containing his exposition of the happened real facts. He may submit this memory or to avoid to submit in that phase of the process. Submitting the memory two alternative coexist: The judges come to know as the facts really went and this is positive for him. At the same time his accusing, reading the memory, discovers the strategy that the accused wants to pursue, and at that stage of the process, the accused may be disadvantaged by the fact that his accusing discovers in advance his defensive strategy that of course the accusing actor could still manipulate (negative result for the accused)

The two alternatives coexist and they are situation in itself is marked from an intrinsic indetermination that is characterized only from a field of probability. This is the stage of potentiality characterized from the $A(S_i)$ algebra . The actual submission of the memory will actualize one and only one of the two alternatives and the $N_{i,\pm 1}$ algebra will characterize the happened collapse of the situation in one and only one of the two alternatives . The idempotents of the $A(S_i)$ algebra will characterize the Boolean situation.

The idempotents may be

$$\frac{1+E_{03}}{2} \text{ or } \frac{1-E_{03}}{2}$$

If the subject benefits to submit the memory we have $E_{03}->+1$ (seen as Boolean function the first idempotent tends to +1 and the second to 0) . The opposite situation ($E_{03}->-1$) happens if the subject does not benefit submitting the memory.

Let us take now a step on .

We have the following Clifford spaces

$(E_{01},E_{12},E_{13}),(E_{01},E_{22},E_{23}),(E_{01},E_{32},E_{33}),(E_{02},E_{11},E_{13}),$ $(E_{02},E_{21},E_{23}),(E_{02},E_{31},E_{33}),$ $(E_{03},E_{11},E_{12}),(E_{03},E_{21},E_{22}),(E_{03},E_{31},E_{32}),(E_{10},E_{23},E_{33}),(E_{10},E_{22},E_{32}),$ $(E_{10},E_{21},E_{31}),$

$(E_{20},E_{13},E_{33}),(E_{20},E_{12},E_{32}),(E_{20},E_{11},E_{31}),$ $(E_{30},E_{13},E_{23}),(E_{30},E_{12},E_{22}),(E_{30},E_{11},E_{21}),$ $(E_{01},E_{02},E_{03}),,(E_{10},E_{20},E_{30})$

we have explained that, when we are at order n=4 of the Clifford algebra, we have not only the two basic algebraic Clifford sets (E_{01},E_{02},E_{03}): and (E_{10},E_{20},E_{30}), but, in addition, we have also all the other basic Clifford sets that we have introduced. Each of this basis element is able to connect one mirroring entity with the other.

Let us consider as example the third basic element E_{03} in the first mirror structure and the third basic element E_{30} in the second mirror structure. They are interconnected by the Clifford basic element E_{33} that in fact appears as independent algebraic Clifford set in the following subgroups:

(E_{01},E_{32},E_{33}) ,

(E_{02},E_{31},E_{33}) , (E_{10},E_{23},E_{33}) , (E_{20},E_{13},E_{33}).

In brief we have that

$$E_{03} = E_{33}E_{30}$$

that is to say: both the abstract self – referential entities E_{03} and E_{30} are not independent one from the other, but instead, in their self-referential structure, supported from the common element e_3, they are mirrored interfaced through E_{33}.

Note that this does not happen obviously only for the couple (E_{03}, E_{30}). Every basic entity pertaining to the first mirroring neuron structure is interfaced with one of the second mirroring interface structure.

Take the couple (E_{02}, E_{20}), it will be interconnected by E_{22} having

$$E_{02} = E_{22}E_{20}$$

Take the couple (E_{01}, E_{10}), it will be interconnected by E_{11} having

$$E_{01} = E_{11}E_{10}$$

Take now the couple (E_{02}, E_{30}), it will be interconnected by E_{32} having

$$E_{02} = E_{32}E_{30}$$

The same thing happens as example for the couple (E_{01}, E_{30}), it will be interconnected by E_{31} having

$$E_{01} = E_{31}E_{30}$$

We could continue with such tutorial but it is evident that such connecting mirroring function exists for any couple of basic elements that we would aim to consider.

There are two important conclusions that arise:

The first conclusion is that abstract entities are interconnected. It is this loom of possible interconnections that realizes the basic mirror features of our psycho-neuronal net.

The second conclusion is that we are not in presence of a trivial interconnection. Remember that each algebraic set, given in the

(E_{01}, E_{12}, E_{13}) , (E_{01}, E_{22}, E_{23}) , (E_{01}, E_{32}, E_{33}) , (E_{02}, E_{11}, E_{13}),

(E_{02}, E_{21}, E_{23}) ,(E_{02}, E_{31}, E_{33}) , (E_{03}, E_{11}, E_{12}), (E_{03}, E_{21}, E_{22}) , (E_{03}, E_{31}, E_{32}) ,(E_{10}, E_{23}, E_{33}), (E_{10}, E_{22}, E_{32}), (E_{10}, E_{21}, E_{31}),(E_{20}, E_{13}, E_{33}) , (E_{20}, E_{12}, E_{32}) ,(E_{20}, E_{11}, E_{31}), (E_{30}, E_{13}, E_{23}) ,(E_{30}, E_{12}, E_{22}) ,(E_{30}, E_{11}, E_{21}) , (E_{01}, E_{02}, E_{03}) , (E_{10}, E_{20}, E_{30})

is a Clifford algebraic set to which we may apply all the quantum features that we discussed in [1] and first of all they realize a field of probabilities based on their ontological nature of potentiality. We have a net of interconnections and an superintending quantum probabilistic field that in its abstraction has its basic role.

Let us consider the basic element E_{03}. We know that such basic element has the ontological potentiality to assume the value (+1) or the value (-1) in the basic algebra $A(Si)$. Still we know that if it assumes the value (+1) we go in the algebra $N_{i,+1}$, while instead if it assumes the value (-1), we go in the algebra $N_{i,-1}$. Let us consider that the value (+1) is collapsed.

Following the rules in the chapter I we will have that:

$<E_{01}>=<E_{02}>=0$ and $E_{01}E_{02}=i$

Looking to the basic algebraic sets given in

(E_{01},E_{12},E_{13}),(E_{01},E_{22},E_{23}),(E_{01},E_{32},E_{33}),(E_{02},E_{11},E_{13}), (E_{02},E_{21},E_{23}),(E_{02},E_{31},E_{33}), (E_{03},E_{11},E_{12}), (E_{03},E_{21},E_{22}),(E_{03},E_{31},E_{32}),(E_{10},E_{23},E_{33}),(E_{10},E_{22},E_{32}), (E_{10},E_{21},E_{31}),

(E_{20},E_{13},E_{33}),(E_{20},E_{12},E_{32}),(E_{20},E_{11},E_{31}), (E_{30},E_{13},E_{23}),(E_{30},E_{12},E_{22}),(E_{30},E_{11},E_{21}), (E_{01},E_{02},E_{03}),,(E_{10},E_{20},E_{30})

we will able to select two algebraic sets. The first will give

$E_{01}E_{30}E_{02}=i$ and $E_{10}E_{20}E_{03}=i$

with

$<E_{10}>=<(E_{20}E_{30}>=0$

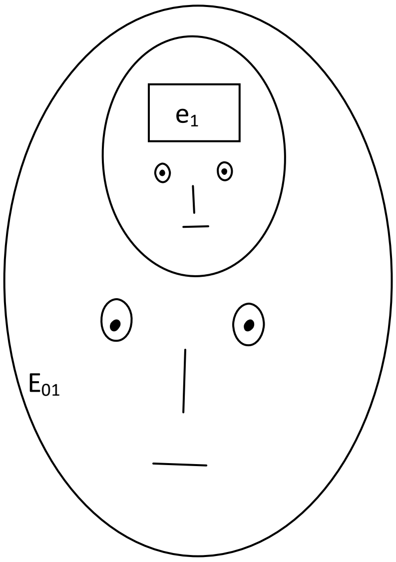
Such result unequivocally predicts that the mirrored interfaced element E_{33} will assume the value (+1) and E_{30} will assume the value (+1).

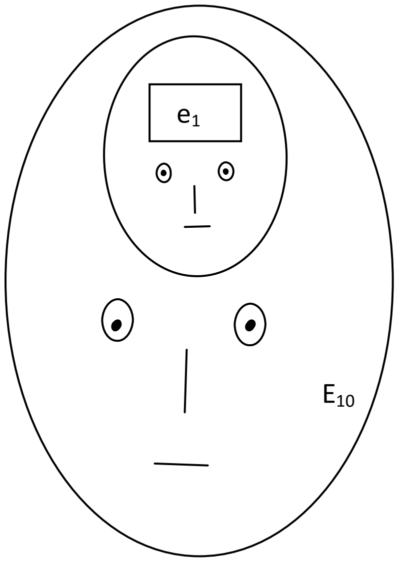
Note the importance of the result that we have obtained. We have given proof on the manner in which, starting with the value of the first mirroring structure (E_{03}) it will be mirrored from the second mirroring structure (E_{30}).

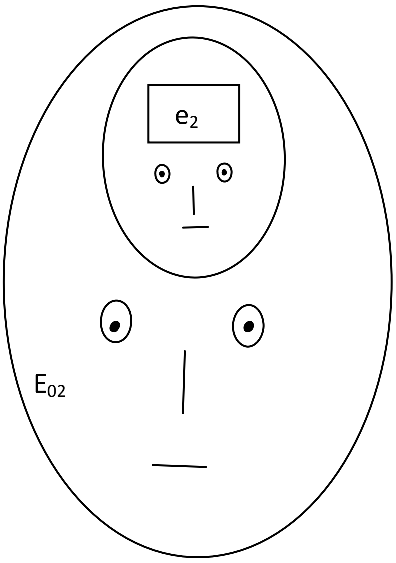
We have given proof that if the first mirroring system triggers +1 in E_{03}, consequently the second mirroring system will trigger +1 in E_{30} (one mirror image of the other).Both relate the Self function represented by e_3.

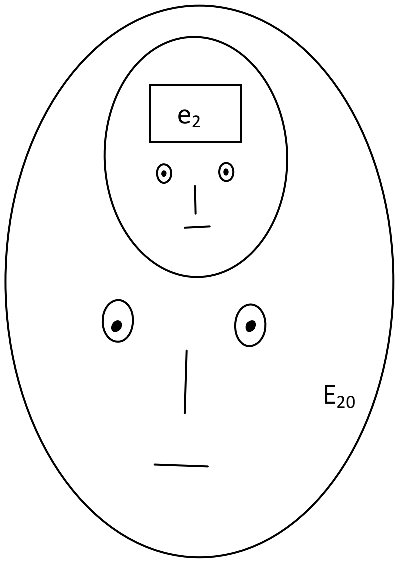
As it is evident, such elaboration has required the use of the theorems given in [3] for Clifford algebras, the $A(Si)$ and the $N_{1,\pm1}$.

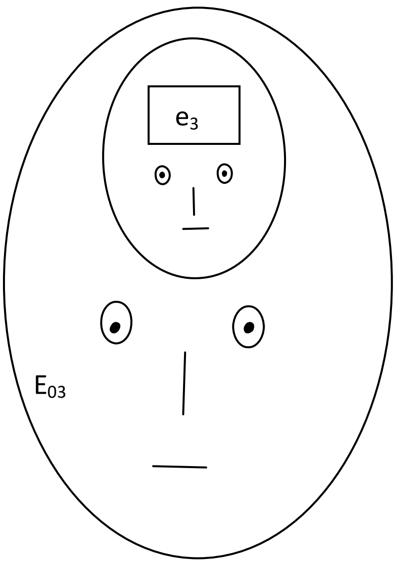
For further clearness we add other figures explaining our approach

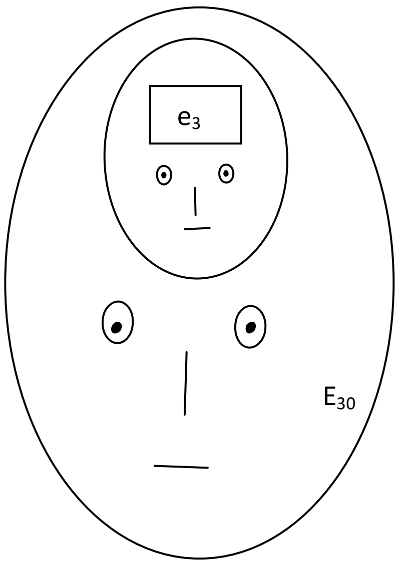

e_1
E_{01}

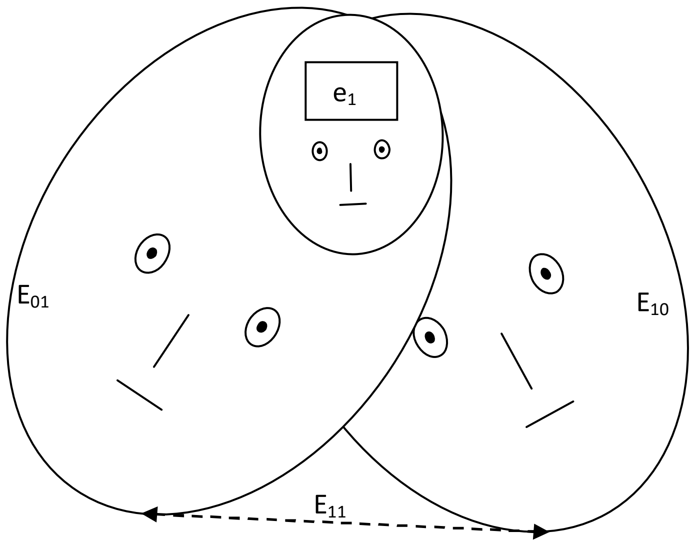

e_1
E_{10}

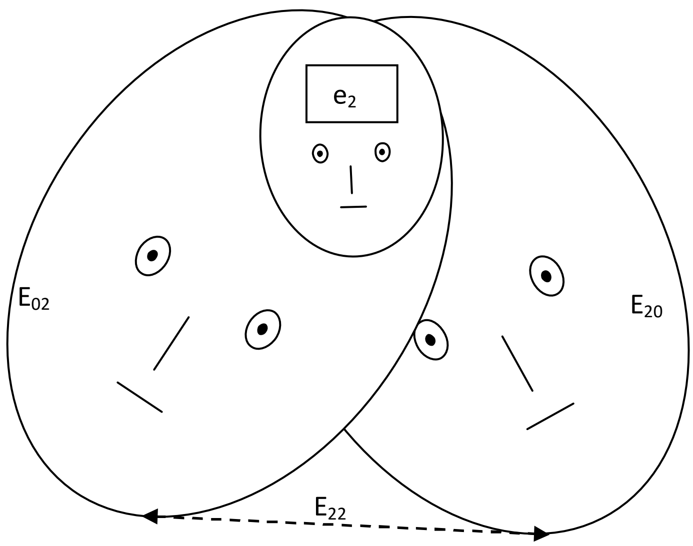

e_2
E_{02}

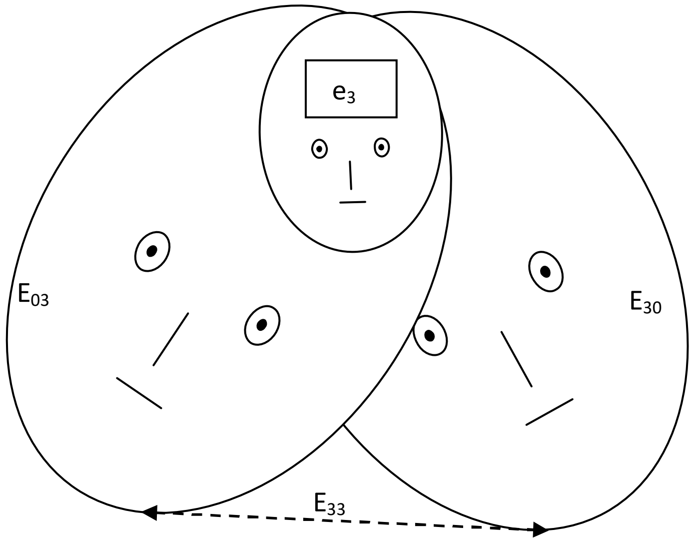

e_2
E_{20}

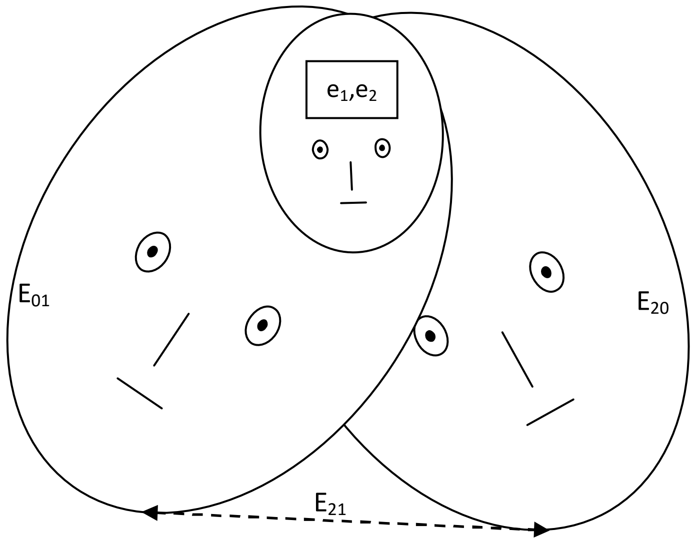

e_3
E_{03}


e_3
E_{30}


e1
E01
E10
E11


e2
E02
E20
E22


e3
E03
E30
E33


e1,e2
E01
E20
E21

The problem relating our mirror exploration of mind entities by an algebraic quantum basis is that we should be able to account for asymmetry that is intrinsic in such mechanisms of our mind .

Previously we have assumed, as example of our mirroring system, the situation that the first mirroring system, given in this case by E_{03}, assumes as example the numerical value (+1). Passing through the mirrored interfaced system represented by E_{33}, also the mirroring system E_{30} assumes the value (+1). Our theory fully holds if we are able to predict by it that there is the other cases in which, starting with the value (+1) for E_{03}, we obtain instead (-1) for E_{30} when passing through the mirrored interfaced system E_{33}.

This is exactly what our theory predicts. Applying again the mathematical developments previously elaborated for the case of $E_{03} \to +1$, and $E_{30} \to +1$, we obtain in this second case that

$$< E_{01} >=< E_{02} >= 0 \quad \text{and} \quad E_{01}E_{02} = i$$

with

$$E_{02}E_{30}E_{01} = i$$

thus predicting unequivocally that $E_{30} \to -1$

and

$$E_{20}E_{10}E_{03} = i$$

which unequivocally predicts that $E_{33} \to -1$.

If the first mirroring system triggers +1 in E_{03}, this is the case in which consequently the second mirroring neuron system will trigger -1 in E_{30}. Again, our treatment holds independently from the particular choice of the basic element and of the particular value that we have attributed to it. So, it is universal.

In this manner we have given also proof of the "asymmetric" case, and now our exposition is complete.

References

[1] V.A. Lefebvre , Algebra of Conscience, Springer , December 2010.

[2] Goertzel, B., Aam, O., Smith, F.T., Palmer, K., Mirror Neurons, Mirrorhouses, and the Algebraic Structure of the Self, http://www.goertzel.org/dynapsyc/2007/mirrorself.pdf

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