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RESEARCH ARTICLE

PRESENCE OF THE CHARACTERISTICS OF 'POTENTIAL MOLECULE' IN EEG SIGNAL

Flower J.R. and Chuckravanen D

Gilchrist Institute for the Achievement Sciences, ltd 34 Palmer Ave., Bronxville, NY 10708, USA.

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Abstract

It has long been posited that there is theoretically and qualitatively a type of manifestation that occurs when someone has the will to change completely his mindset to achieve his greatest potential. It is said that this manifestation happens owing to the permission for previously untapped cognitive neural cells to create new neuronal networks which leads to elevated cognition and human development (Flower, 2006; Flower, 2015; Flower 2019). Through his close observation of the cell development, Dr. Langham founded a model which consists of three distinct components that are the (i) creative component, (ii) organisational component, and (iii) the functional component of the cell development. Each of these components consist of various number of aspects that exhibit certain characteristics. Therefore, this research employed encephalography (EEG) data from healthy human participants to find out the characteristics of these aspects in the field of the human decision-making process or their thought processes. It was found that there was strong presence of most of those aforesaid aspects in the brain signal data and subsequent research studies can analyse other types of physiological data or other types of nature data to ensure the veracity of these results.

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Introduction:-

One important dynamic GST model that has been researched is a Natural Systems concept (Flower, 2006; Flower, 2015; Flower, 2019) who specialized in plant genetics. Langham(1969) discovered a model which was based on the creation of a cell and this model consists of three distinct parts. The concept of the model is based on the structure, the principles as well as the relationships that he observed as operating in the cell's development. The three main parts of the model are (1) creative component, (2) organisational component, and (3) functional component. These three components break down into segments as follows: three creativesegments, six organisational segments and four functional segments which give a total of thirteen segments. After a thorough pursuit of the Langham theorem, it is suggested that it is feasible that the principles of 'cell development' can be applied to human understanding (Flower, 2006; Flower, 2015; Flower, 2019). Langham's thirteen principles can provide a paradigm which is able to integrate various disciplines pertaining human understanding using a common biological focus ground. The Langham's model can decode as well as clarify information. Moreover, information can be expressed as dual-type responses such as yes or no, on or off, up or down similar like yin-yang energy flow. This is the universality of the Langham model which represents a system of the whole and parts as well as polarity. In addition to that there are currently no satisfactory processes that explain changes that occur physically, mentally, emotionally and spiritually but there is the potential science possible theory that can address all of these. This theory of potential science has its

Corresponding Author:- Flower, J. R.

Address:- Gilchrist institute for the achievement sciences, ltd 34 Palmer Ave., Bronxville, NY 10708, USA.

basis in biology (Flower, 2006; Flower, 2015) and it is related to the aspect of cellular development which was discovered by the genetist Dr. Langham (Langham, 1969; Langham, 1974) and the cosmological aspect of the science of potential was created by the Gilchrist institute through the implementation of concepts of Leibnitz, Descartes, Spinoza, Einstein and Aristotle (Flower, 2006; Flower, 2015; Flower, 2019).

Development of the concept of Potential Molecule or the cell:

By virtue of the development of the cell, it is found that the process of the creation has three components or phases: (1) creative phase, (2) organisational phase and (3) a functional phase. These three aspects break down into 13 aspects. This potential molecule contains these 13 aspects and these can build-up to solid natural/physical reality which is in a sense 'pantheistic'.

Creative component:

Langham discovered the living geometry of a cell (Langham, 1969). His geometrical model was based on title-specific principles identified during the creation of a cell. The model contains three parts which are pulse, wave and spiral. Cell development starts with 180 degrees polar pulses within the seed, and this initial pulse starts from North to South followed by an East to West pulse at 90 degrees to the original pulse which form the X-Y axes of the cartesian coordinate system. The final pulse of the creative phase is a front-to-back movement forming a 3-dimensional Z-axis. This completes the cell's creative phase of development.

Organisational component:

For the organisational phase of the cell development, the cell then explodes into a wave-like motion attaining a maximum radius or expansion point in each direction of the three axes. The organisational phase consists of waves owing to the expansion (explosion) of the cells emanating from the 3 axes (X, Y, and Z) and therefore it consists of 6 aspects based on the directions of these 3 axes (3 x 2). The six wave motions actually complete the organisational phase of the cell development.

Functional component:

Last but not the least, the third and final stage of the cell development is the Functional phase in which the cell begins to spiral, specifically at its corners. The spiraling impacts four points within the cell which best illustrated as a neutron spiraling around the earth, touching both poles and the two opposite points along the Equator line. These represent points that are found on the corners of the cell (North (N), South (S), East (E), and West(W)).

The result gives 13 aspects of the cell geometry: three in the creative phase, six in the organisational phase and the four in the functional phase and these 13 aspects are important in cell development. One important principle of the model is that each phase shows clearly the property of polarity in the 180⁰ movements of the pulse, wave as well as the spiral patterns.

Theory of EEG signal and analogous to 'cell development':

Encephalography is an electrophysiological monitoring technique to measure electrical activity of the brain. The EEG measures voltage fluctuations that come from the ionic current within the neurons of the brain (Niedermeyer E.; da Silva F.L. 2004). In fact, when a person does rapid visual processing task, the person has to think and therefore these thought processes cause change in the amplitude of EEG signals and this change is caused by the birth or creation of neuronal links in order to achieve the desired response. In this way, this process mimicks the processes that are involved in 'cell development' as the EEG signal is a non-stationary and stochastic (appear random) biological signal. The research methodology that was employed in this study is elaborated in the following section.

Research Methodology:-

In this research, brain signals from 75 healthy human participants while performing visual cognitive tasks were employed to analyse the characteristics of their brain signals in terms of the presence or absence of the characteristics for the aspects associated to each component (creation, organisational and functional). The EEG full dataset is open source and reliable as previous research conducted analyses on those data but for different purposes (Zhang et al., 1995). This research analysed brain signal data from 75 healthy human participants.

The reason for the use of this type of brain signals is that the human participant, every time, has to make quick decision based on cognitive tasks that they have never performed before and by making quick decision, specific

neural pathway should be in place or created so as the human participant can perform well in that particular cognitive tasks or there is a change in neural pathway depending on the rapidly changing visual task and the associated actions that are required to respond to such task (Chuckravanen, 2014; Chuckravanen et al, 2015). Therefore, these 13 concepts were applied on healthy human subjects' electroencephalogram (EEG) data (Matran-Fernandez and Polo, 2017) while the human participants perform cognitive tasks.

EEG data collection and characteristics:

The EEG data was recorded from 75 healthy human subjects and the EEG data, of size 701MB, were downloaded and they were called 'EEG_Full.tar'. After decompressing the file using 7z1900-x64.exe software, it consists of the human subjects' EEG data and also all data were initially in compressed *.tar format. Data contains EEG measurements from 64 electrodes placed on the human subjects' scalps which were sampled at 256 Hz (3.9-msec epoch) for 1 second.

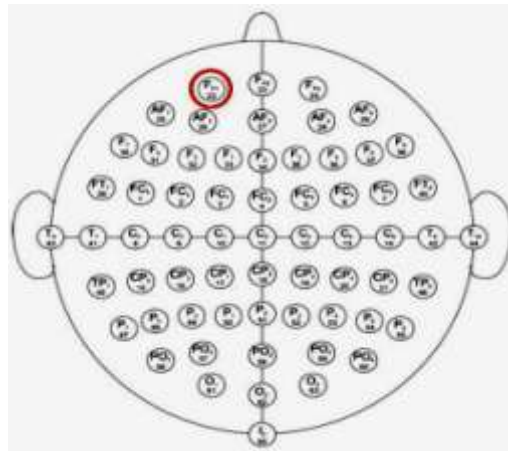


Figure 1:- The position of the FP1 electrode (circled in red) in the 10-20 international system of electrode placements.

Visual Stimulus for cognitive activity:

The human participants were exposed to either a single stimulus (S1) or to two stimuli (S1 and S2) which represented pictures of objects chosen from the 1980 Snodgrass and Vanderwart picture set. When two stimuli were shown, they were presented in either a matched condition where S1 was identical to S2 or in a non-matched condition where S1 differed from S2.

Software analysis of EEG signals:

In this research, Matlab R2009a software was used to conduct the analyses in terms of finding characteristics in the brain signal data which conform to the characteristics of the 13 aspects that exist for each component type of the cell development or the 'potential molecule' development.

Analysis methodologies applied on the EEG datasets:

First of all, in order to maintain consistency on the analysis, the following set of analysis methods are applied sequentially on each EEG dataset that were recorded from the human participant. The following variables were created and then described. Most of these variables represent dichotomous data and these variables are based on the aspects that were defined by researchers (Flower, 2006; Flower, 2015; Langham, 1969).

F1:

Let F1 be a variable representing the North to South movement for the creative phase of the 'cell development'.

Observation:-

If it is observed to occur on a particular EEG signal, then a word 'yes' will be inserted in the summary table and if it does not appear on that particular signal, then a word 'no' will be inserted in the summary table. (Yes/No)

F2:

Let F2 be a variable representing the East to West movement.

Observation:

The observation of a second pulse that happen at a phase difference of $\pi/2$ for the creative phase of the 'cell development'. The scalar product of the direction of the tangent at the minimum of a signal and the slope north to south of a signal should be able to approximately equal to the $\pi/2$

– Phenomenon. (Yes/No)

F3:

Let F3 be a variable representing the Front to back movement.

Observation:

There is a kind of movement when one looks from the front of the signal to the tail of the signal for the creative phase of the 'cell development'. There is a shift in sign value of EEG data from positive to negative. In order to notice this, we will do plots (direction field of the EEG data) based on first order differentiation of the data (Yes/No)

F4:

Let F4 be a variable which represents the motion of the signal in the x-direction for the organisational phase of the 'cell development'. (Yes/No)

F5:

Let F5 be a variable which represents the motion of the signal in the y-direction for the organisational phase of the 'cell development'. (Yes/No)

F6:

Let F6 be a variable which represents the motion of the signal in the z-direction for the organisational phase of the 'cell development' (Yes/No)

F7:

Let F7 be a variable which represents the motion of the signal in the x'-direction for the organisational phase of the 'cell development'. (Yes/No)

F8:

Let F8 be a variable which represents the motion of the signal in the y'-direction for the organisational phase of the 'cell development'. (Yes/No)

F9:

Let F9 be a variable which represents the motion of the signal in the z'-direction for the organisational phase of the 'cell development' (Yes/No)

F10:

Let F10 be a variable which represents the presence of the corner North of the functional phase of the 'cell development' by looking at the polar plot of the normalised and modelled complex EEG signal (Yes/No)

F11:

Let F11 be a variable which represents the presence of the corner South of the functional phase of the 'cell development' (polar plot) (yes/no)

F12:

Let F12 be a variable which represents the corner East of the functional phase of the 'cell development' by looking at the polar plot (Yes/No)

F13:

Let F13 be a variable which represents the corner West of the functional phase of the 'cell development' by looking at the polar plot of the complex EEG signal (Yes/No)

These 13 variables look at the 13 aspects and Dr. D. Chuckravanen included also a new variable to this field which is called eccentricity of the polar plot (that are usually applied on ellipse or elliptical objects to see how flatten the ellipse formed by the 4 variables (F10, F11, F12, and F13) and it may give a further insight into the characteristics of the functional phase of the 'cell development'.

F14:

Eccentricity variable (a value ranging from 0 to 1) (See illustrations in Figures 2a and Figure 2b)

Some examples of some elliptical shapes and the corresponding values of eccentricity e.

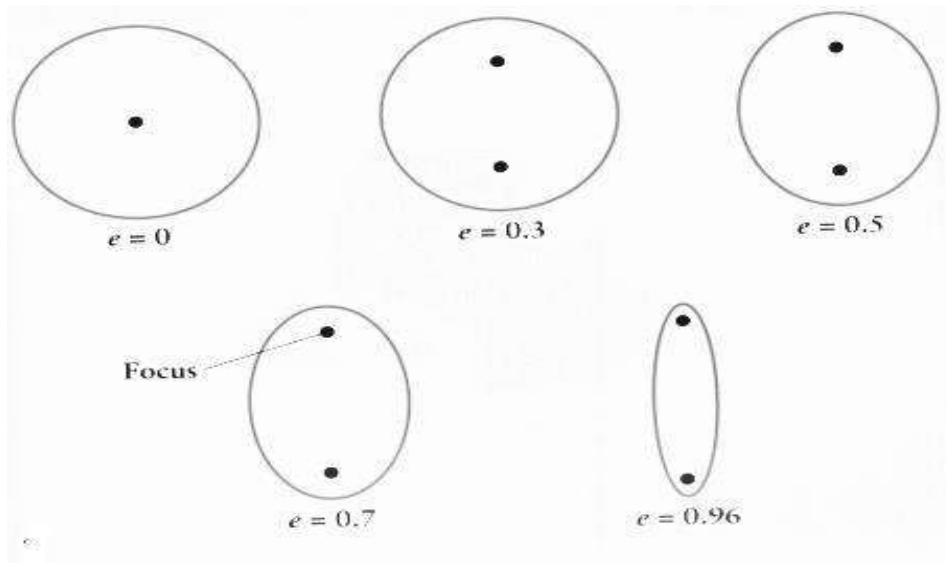


Figure 2a:- Effect of changing the value of eccentricity and the shape of the ellipses.

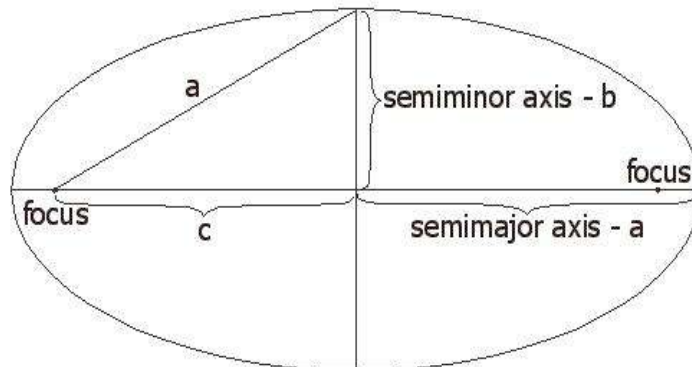


Figure 2b:- Definition of the variables a and b to compute the eccentricity e..

The computation of eccentricity, e,,is computed using the following equation (1).

$$e = \sqrt{1 - \frac{b^2}{a^2}}$$

... **Equation (1)**

Results:-

An example of one particular participant's EEG data is shown below (participant ID: co2c0000337). The duration of the EEG data is 1 second and it is sampled at 256Hz. In this brain signal, one can clearly observe that there are

frequent changes through time and it is not a clean sinusoidal curve. Moreover, the EEG data emanated from the pre-frontal part of the brain (FP1) and this part of the brain governs the decision-making processes (Chuckravanen, 2014) and all decision based on logic are normally conducted at the frontal lobes or pre-frontal lobes. In order to make decision, there are neural pathways that connect the frontal lobes to the occipital lobes for appropriate decision to be made based on what the participant observed or perceived on the screen.

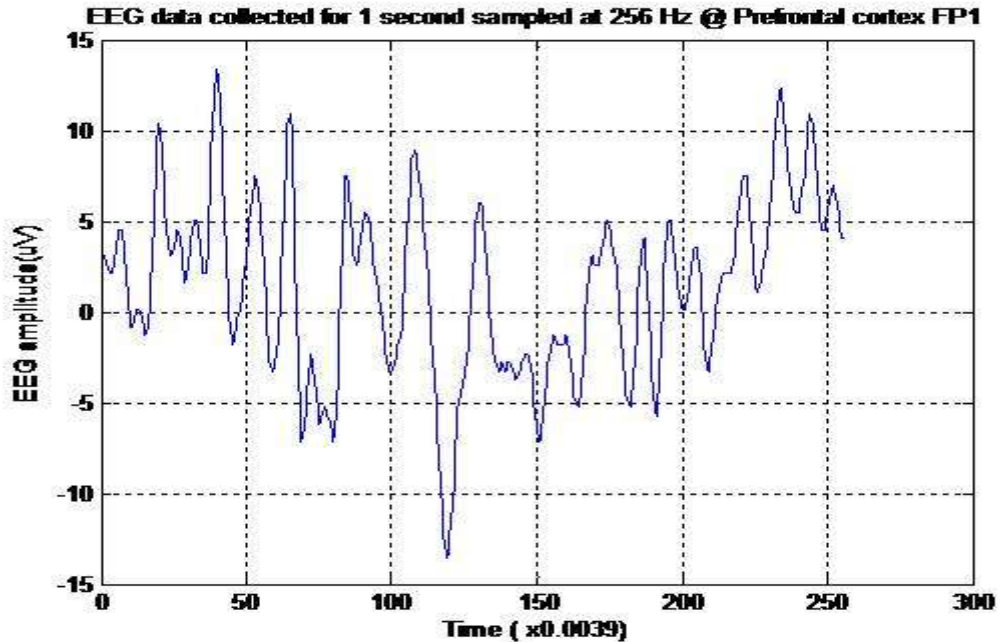


Figure 3:- EEG data at prefrontal lobe of the human brain (sampled at 256 Hz for 1 second duration).

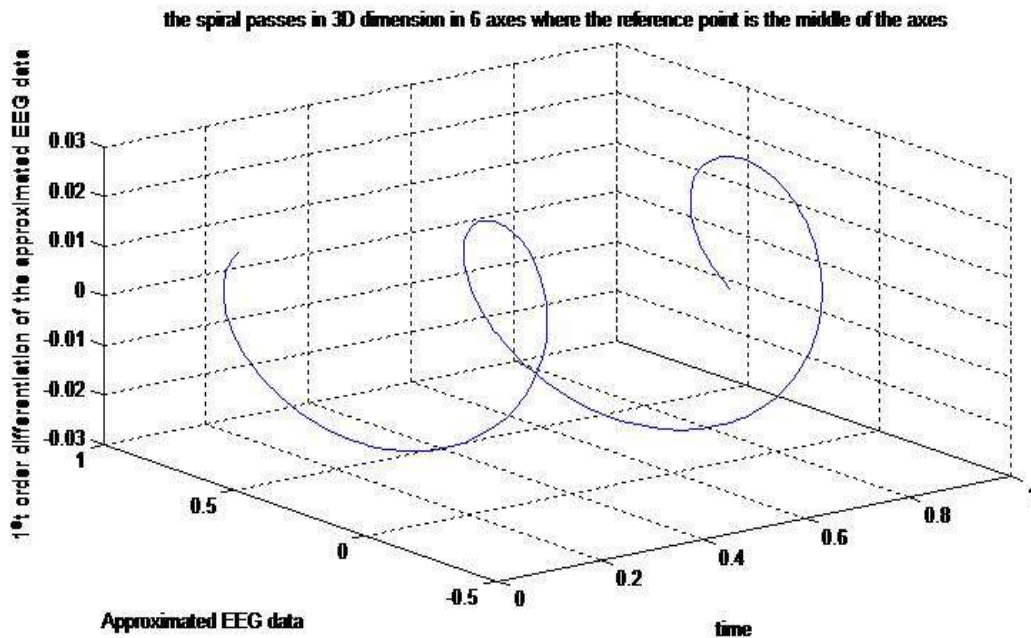


Figure 4:- Spiralling effect in the data when illustrated in 3D dimension (x-axis is time, y-axis is approximated EEG data and z-axis is the first order differentiation of the approximated EEG data).

Table 1:- Results based on the EEG analysis of the 75 participants data (yes means presence of a variable and no means the absence of the respective variable).

Participant	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
-------------	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----

														(e)
1	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9975
2	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
3	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.9987
4	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	0.9988
5	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
6	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
7	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
8	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
9	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
10	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
11	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9985
12	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
13	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
14	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
15	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9983
16	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
17	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9994
18	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
19	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
20	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
21	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9991
22	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
23	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
24	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9985
25	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
26	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
27	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
28	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
29	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
30	Yes	Yes	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	N/A
31	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
32	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
33	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
34	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9983
35	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989

36	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
38	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
39	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
40	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	N/A
41	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
42	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9985
43	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
44	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
45	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
46	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9983
47	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
48	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9994
49	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9985
50	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
51	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
52	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9991
53	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
54	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
55	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9985
56	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
57	Yes	Yes	No*	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	N/A
58	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
59	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988
60	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9982
61	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9991
62	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
63	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9988

64	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9986
65	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
66	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	N/A
67	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
68	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9975
69	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987
70	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9977
71	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9979
72	Yes	Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9994
73	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9989
74	Yes	Yes	No	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9981
75	Yes	Yes	No*	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	0.9987

In Table 1, the notation No* means that the data observation is not clear and a decision cannot be made. N/A means not applicable or observation of the respective variable is not clear as well.

Table 2:- Summary of the overall results for each variable.

Variables	% Presence in the EEG signals
F1	98.6
F2	98.6
F3	32
F4	97.3
F5	97.3
F6	97.3
F7	97.3
F8	97.3
F9	97.3
F10	88
F11	88
F12	85.3
F13	85.3
F14	0.8502 ± 0.3553 (mean±SD)

Discussions:-

In this research study, it was found that there is a very strong presence of F1 (which is one of the aspect of the creative phase of 'cell development') with similar strong percentage of presence with the variable F2 that represents the East to West movement (which insinuates that there is the presence of the $\pi/2$ – phenomenon. However, the third aspect of the creative phase of the "cell development", the presence of the F3 variable was very weak because there was breaking trends in the signals and did not show clearly the movement from front to back in the creation stage of the 'cell development'. Results from the first phase of this research study, that is the creative phase, demonstrate that there is in fact an initial pulse that occurs in the EEG signals as the significant peaks that were found in the EEG

signal decrease subsequently from maximum values to minimum values. The phase differences between the maximum peaks and the subsequent minimum peaks are functions of π . This finding is in line with Dr. Robert Flower who applied similar concept on Financial time series data (Flower, 2006). Therefore, the initial pulse for the creation of thought process is a function that depends on π . This study also demonstrated that the second pulse of action manifests in by means of $\pi/2$ - phenomenon and this was proven using scalar product theory. The third pulse of the creative phase of the 'cell development' or the potential molecule was weakly observed, in general, using a 3D-representation using spiral structures. The 3D-representation of the EEG data using the EEG data itself, its first order differentiation through time as well as time factor show how the thought process spirals through time. The famous mathematician/philosopher Pythagoras used the creative phase principles in terms of 3 points that are awareness, beliefs and communication. All the aspects of the organisational phase show strong presence in the illustrations of the brain signals and they were all above 97%. Apart from the presence of these aspects in brain signals, it has been posited that these aspects are also found in mathematical principles, in wave theories (physics) as well as philosophy (Flower, 2006; Flower, 2015). For example, in mathematics, the 6 aspects can represent identity, commutative, transitive, reflexive, distributive, symmetry while in wave property theories in physics, these 6 organisational aspects can represent refraction, transmission, attenuation, reflection, interference and diffraction. These 6 organisational aspects help us to observe the happenings in the world in details (parts) as well as a whole.

As for the functional phase, all four aspects demonstrated a presence of over 85% and so they are also strongly present in the brain signals. It looks as if that the development of thought or the creation of thought process follows a distinct spiralling pathway. This thought process has to visit certain locations of the brain in order to achieve a successful thought process or a successful concretisation of the thought.

Conclusions:-

This research study shows that there are strong presence of practically all 13 aspects in brain signals despite the presence of one particular aspect F3 (front to back movement) appears to be weak and this may depend on the type of data utilised. However, all the 12 aspects showed strong presence in the EEG signal data. The computed eccentricity e appeared to be very high with values above 0.99 and with such high values this demonstrates that the movement that occurs during the organisational phase of the 'cell development' is mostly elliptical that approaches the parabola. There is a strong presence of duality in all the phases and the manifestations are in function of π , as well as there is strong evidence based on this work that the cosine and sine functions are combined to produce complex 'living things' or thought processes or decision-making processes. The 6 organisational principles can be regarded as different aspects of the whole organisation of the human decision making process and these principles are also found in mathematics as well as physics.

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Appendix:-

Matlab codes (copyright Dr. D. Chuckravanen)

```
% Analysis m- file to analyse EEG data
```

```
% declare a value to the channel variable to avoid error in program. FP1=1;
```

```
% dataset of each participant will be placed here
```

```
I=[EEG_DATASET];
```

```
%plot of the signal
```

```
figure(1),
```

```
plot(I(:,4)); grid on
```

```
ylabel('EEG amplitude(uV)');
```

```
xlabel('Time ( x0.0039)');
```

```
title('EEG data collected for 1 second sampled at 256 Hz @ Prefrontal cortex FP1');
```

```
time=[1:256];
```

```
time1= 0.0039*time;
```

```
%investigate the consecutive maximum peak to a minimum peak - is there a % phase difference of pi
```

```
%investigate whether there the scalar product of the tangent of the minimum %to the slope (North to South) is 0
```

```
%plot of the front to back
```

```
y=I(:,4);
```

```
y1= diff(y);
```

```
figure(2)
```

```
plot3(time1(1:255),y(1:255),y1); axis on; grid on; xlabel('Time');
```

```
ylabel('EEG amplitude(uV)');
```

```
zlabel('First order differentiation of EEG');
```

```
title('Illustration of the front to back movement');
```

```
%obtained function from previous experiment - parameters may change f=3;
```

```
A= 0.2; %change Y level
```

```
B=-0.25;
```

```
tt=time1;
```

```
y2= 0.1*sin(0.7*pi*f*(tt+B) + 0.5) + 0.4*cos(1.5*pi*f*(tt+B)) + A;
```

```
figure(3),
```

```
yy=y./max(abs(y));
```

```
plot(time1,yy,'b', time1, y2,'g');
```

```
%plot of the spiral
```

```
figure(4),
```

```
plot3(time1(1:255),y2(1:255),diff(y2), 'b'); grid on;
```

```
title('the spiral passes in 3D dimension in 6 axes where the reference point is the middle of the axes');
```

```
xlabel('time');
```

```
ylabel('Approximated EEG data');
```

```
zlabel('1st order differentiation of the approximated EEG data');
```

```
%'polar plot' of the modelled signal
```

```
figure(5),
```

```
plot(y2(1:255),diff(y2), 'b'); grid on;
```

```
title('Plot depicting the spiral passes through corners N, S, E, and W');
```

```
xlabel('Approximated modelled EEG data using cos and sin functions'); ylabel('first order differentiation of the modelled EEG through time');
```