JOHN N. HATZOPOULOS

EDUCATION AND NEURON NETWORK BASED SYSTEMS

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The scientific bases for the educator, the parents and the educated

To all free minded people

MYTILENE

2014

This work is addressed to all people who with one way or another are educators including parents and the effort is to establish a framework of scientific basis, according to the equilibrium rules in Nature to help advance education in the 21st century. The focus in this work is human mind because all human actions and resulting human behaviour are initiated and executed through human mind. Furthermore, human mind is hosted within human brain, a neuron based structure, and neuron networks, as they are simulated in a computer system, are studied to understand how human brain works. A basic function of neurons is that they hold programming instructions, which are capable to perform data processing, forming a computer system with parallel architecture. Such programming instructions, which may be called genetic software are developed through pregnancy to run most vital organs of human body and to initiate the mind -talent- process and the motion process. Therefore, mind and motion genetic software are developed continuously through the life of a person and education is approached as the effort to develop a virtuous mind with optimum constructive performance, being able to defend any external programming invasion such as propaganda and brain wash for destructive purposes.

The reader may find some difficulties to read some parts of the book with some mathematical content. Therefore, these parts may be ignored without significant loss on the basic ideas developed in this book.

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TABLE OF CONTENTS

PREFACE

A question that has been occupying my mind for many years that I have been an educator in higher education is: *What would happen if the knowledge that an education institution produces and transmits is not used correctly?* No matter how simple such a question sounds, the answer is so difficult as the decision to be made on right and wrong, correct and error or on good and bad. However, it requires a great effort to provide a solid foundation for such concepts. Fortunately, similar questions were raised by people thousands of years ago, and there has been developed enough material from which one can draw scientific answers to similar kind of questions always based on logical reasoning as founded by philosophy. Moreover, having drawn basic ingredients from previous knowledge that was developed by leading educators, then education can discover and release one's internal forces, which are in a latent state and thus becoming a more active citizen to benefit of oneself and one's fellow people. The release of these forces should normally be aided by the organized school system which, however, for a strange reason, although it has the ability to do it, does not help as much as it could towards this direction. Therefore, it is crucial for the education system to provide scientific answers to these questions and the effort in this book is to help in providing them.

Another question I have in mind is *why modern philosophers are occupied so much with analyzing and admiring ancient philosophers, but they do not spend much of their energy to advance philosophy beyond the point that ancient people reached*. Overanalyses that exceed human dimensions in philosophy, lead to an interminable introversion which virtually "eats itself" without responding properly to modern educational needs that are countless. Therefore, education needs advanced philosophical developments to support

its modern needs. In my opinion to deal with philosophy is not necessary to have particular qualifications, since each individual has a very powerful logic and reason. The use of logic in combination with the freedom of mind, it is enough to help developing philosophical bases to advance education.

A last but not least a set of questions I had was: *what would be the meaning of propaganda; brain wash; and brain programming; bias and deception; are humans like computers; can humans be programmed; who does such programming; for which reason; how such programming attempt affects the education of a person*; Therefore, another crucial for education matter is the study of *human brain* as a *neuron based structure,* because such structures are programmed by Nature and can be programmed by humans.

This work is an effort trying to provide scientific answers to all these questions and introduce the basis for a better education system. However, the education problem is approached as a system of mechanisms which influence the function of the human brain. Such mechanisms are neuron based structures which are well known as they are simulated and programmed in electronic computers usually to solve complicated problems. Therefore, education may be viewed as a neuron network programming system to develop *a genetic type of information and software* in the effort to maintain an *optimum constructive performance of human mind*. Most genetic software exists from the birth of a person and controls the function of all vital organs of human body including stomach, heart, kidneys, blood pressure, etc., and this software maintains through life its original structure with minimal changes. Consequently, a relatively small portion of genetic software is dedicated to control human mind or human thought and human motion. This software is constantly developed as the person grows up and is influenced by the natural and social environment. This approach is necessary to analytically

explain the reasons people as individuals or as social groups behave in a specific way. However, this approach will help human sciences to better understand and interpret the results of the analysis of samples related to the behaviour of individuals and social groups.

On the other hand, education can be greatly facilitated if there is a clear philosophical (strong reasoning) definition of an *optimum constructive performance human mind model* and *human error model* this is also included in the investigation of the present work. Therefore, philosophy is treated as the mother of all sciences, which contains all sciences including human sciences and education. The conclusions of this work will help to create standards for education in an effort to develop an *optimum constructive performance human mind,* according to the rule of balance in harmony with Nature and also it will help the individual to develop immune bodies against those they try to derange this balance by propaganda and deception means.

This present work is addressed to the wider public, to educators and to all scientists of any specialty, aiming at presenting basic principles that will be the cornerstone of the construction of answers to questions asked. At the same time, new questions are raised and new ideas -as to how to deal with such questions- are introduced, something that will motivate younger people to deal with current problems and to search for answers.

1. Introduction

The events which took place at the beginning of the 1960s - as they have been presented by those who actively participated in their development, that is, the advisers of the leaders of the USA and the USSR - reveal that a nuclear holocaust was avoided clearly by good luck. Nuclear power, on the other hand, was discovered and evolved in the laboratories of universities and research centers by scientists who, in their effort to produce knowledge through research, did not contemplate on whether that knowledge would be used correctly. Similar discoveries that were threatening and continue to threaten the life on this planet have been abundant around the world, such as more nuclear weapons, dynamite, chemical gases, biological weapons, laser beams, etc. A concluding remark could be that most scientists are highly knowledgeable to promote science, but not enough educated to assure that such scientific findings will be used for doing good and not for doing bad.

However, there are much more serious problems in our days regarding the wrong use of knowledge which is threatening directly humans and life in general. For example, the alteration of the environment from thoughtless human activities tends to accelerate the climate change process and we already are experiencing the overheating and extreme weather phenomena in this planet. The worst kind of globalization, which is attempted by destroying nations and human lives through short sited geostrategic, religious, political and economic interests, performed by small groups of uneducated people behind closed doors, reveals the inability of most people to react properly, due to lack of education, thus suffering severe threats against their lives and the environment. The false idea of democracy that people have to vote mostly for those proposed and supported financially by political, economic and religious interests, virtually reveals a distorted kind of democracy most

countries are experiencing on the 21st Century. In all these cases the present education system is unable to stop the deterioration process and to improve quality in life. The effort, in this book, is to work on philosophical structures based on modern scientific analysis to support education and to investigate technological structures that compose human brain, which hosts human mind. However, an important aspect of education is the philosophy, which helps an educated person “to develop *analytical rigour* and the ability to *criticise* and *reason logically*” (former message by University of Oxford Admissions, now after the publication of this book, they deleted it).

1.1 Neuron network programming and education

Growing up in a mountainous village, Komiaki 650 meter elevation, in the Greek island of Naxos, I had to take care of a mule and three goats. The mule was about the same age with me, while the goats were much younger. I would be around 8 years old and I had to walk every morning the goats to the farm, about half an hour through a mountainous trail and then come back and go to the elementary school. The reverse course was in the afternoon and after milking the goats, they will be left in the stable for the night. One very important observation regarding the goats, which at that time I would not be able to explain, was the fact that, while walking on the trail, if they would see other goats on the same trail at a distance, immediately their hair around their neck would come up and they would accelerate their pace to reach the other goats to start fighting. It seems like fighting is the most popular sport among goats.

I start to understand what was going on with the goats when I studied *object oriented computer programming*. In computer sciences, an object has *properties, methods and events* (see Section 4.6). The events trigger certain

methods, which perform certain tasks, working with current state data. We may consider the eye - brain mechanism of the goat as a triggering mechanism in the view of another goat and the methods activated are the one, which turns on the hair around the neck, the other one that does the acceleration and the one that performs the fighting. Properties are adjusted to the current state data such as distance from the other goats, estimation of opponent strength, weight and age of the goats and preparation for fighting.

Raising the question “is there such a system within the brain of a goat;” has a positive answer “Yes” because the brain is a *neuron based structure* and *neurons* can hold data, programming instructions and process the data. Generally, *DNA technology* is capable to create neuron structures, which work in a similar way like a computer. We may use the term *genetic software (SG)* to describe programming instructions being held by neurons, while simply *software (SW)* to describe the electronic computer software. Although DNA technology is working for billions of years, we still are far away of completely understanding its mechanisms and most important, we can only work on modifying such structures, or feeding them with specific data, but we cannot design or create them. Usually neuron based processors have a *parallel architecture*, while electronic computers have a *serial architecture,* despite the fact that there is a tendency in recent years to work with several serial processors, computer clusters, and network cloud computing, by sharing tasks. Furthermore, electronic computers can simulate neuron networks quite similar to DNA based structures and this provides us with a valuable tool to solve complicated problems and understand better DNA neuron based structures. Brain programming is also a way to develop human mind the right, or wrong direction affecting the education of the person and it will be analyzed in this book.

1.2 Structure of the book

This book is composed of seven Chapters the *first one* being the introduction covering the role of neuron based structures in education and analyzing the structure of the book.

Chapter 2 is dealing with philosophical aspects of education and covers the limits of science and scientific truth, human dimensions and basic laws and rules in harmony with Nature as to help education comply with those rules. Consequently, it introduces two models covering the optimum mind performance and acceptable mind performance for a constructive human mind. Then are used mathematics to analyze human error and its acceptable limits to separate right from wrong, good from bad and correct from error. More analysis is performed to provide philosophical bases for stable peace and democratic procedures and for many other things affecting education.

Chapter 3 deals with most environments affecting the development of mind. It gives emphasis on human intervention on the environment and its impact on education. Environments which are studied are: Natural including land, sea and atmosphere, culture, Social, economic, political and religious environment.

Chapter 4 is given emphasis on the education of educators. Basic knowledge an educator must hold to educate people. Such basic knowledge include: Artificial Neural networks to understand how neurons work, Human brain as a neuron based structure to help developing and maintaining an optimum constructive performance, Biological structures, Mathematics as the best tool

of mind, Statistics to understand the rules in harmony with Nature and to establish specifications in terms of variance limits, Computer programming to educate people on being creators, Mind programming to help people avoid destructive attacks, Justice as the chief virtue containing all other virtues, Agriculture to help people control their food quality and increase their freedom by having less dependencies, Energy aspects to protect the natural environment.

Chapter 5 is analyzing the constructive and destructive activities of the human mind and their consequences, especially if they are against the rules in Nature and destroy the harmony with Nature. It is given a taste of cosmogony as an effort for constructive exploration of the Universe and the current globalization process as a destructive activity of the human mind.

Next Chapters are the conclusions based on the presented material and the bibliographical references.

2. Philosophical aspects

Most people have a false vision about philosophy. They think of philosophers being persons with long hair and long beard with strange clothes going around public areas giving boring talks with no meaning. The reason people think this way is because philosophy today, as my professor of philosophy told me, is practically dead. This vision of philosophy is not true and, it is realized if someone visits the University of Oxford website at the Department of Philosophy Admissions, where philosophy is defined as:

... *to help the person (on any matter) to develop analytical rigour and the ability to criticise and reason logically*. The expression (*on any matter*) is added by me.
Notice: This message by the University of Oxford Admissions, has been deleted after the publication of this book.

To develop such abilities you have to have scientific bases of all kinds of science and therefore, *philosophy is the mother of all sciences and contains all sciences*. The classical Greeks who gave a boost to philosophical developments in most of their philosophical schools in their front entrance would have a sign with big letters saying:

“ΜΗΔΕΊΣ ΑΓΕΩΜΈΤΡΗΤΟΣ ΕΙΣΊΤΩ”
(Do not enter if you do not know geometry).

This explains the importance of sciences represented by “Geometry” to study philosophy. Geometry, on the other hand, is a valuable tool for proper scientific training of human mind.

Today, according to a private discussion I had with my professor of philosophy at the Technical University of Athens, philosophy is dead because it is separated from the sciences. This separation took place at the beginning of the Dark Ages around the 6th century A.D. and continues until today.

It is quite interesting to investigate why the separation of philosophy from sciences continues today and why philosophy is dead. Who benefits from this situation about philosophy? etc. A first analysis was attempted by Hatzopoulos J. N., 2002 and Hatzopoulos J. N., 2004 and further such discussion will be in the Chapters to follow.

2.1 Scientific study of Nature, laws and rules in Nature

Scientific process requires strong evidence to support the way of obtaining scientific results or viewing the scientific truth. We all understand that such processes and such results and truths are valid only if there is not any different approach with stronger scientific arguments. This allows science to advance in a dynamic way, in terms that any scientific development has to be based on *analytical rigour* and maintain its strength by undergoing *criticism* and *logical reasoning* (former message by University of Oxford Admissions). This kind of process recognizes the human limitations to obtain the absolute truth and indicates the way to approach the scientific truth within *human dimensions*. In other words, within the human dimensions, there is no absolute scientific truth, but scientists advance science by adding to the scientific truth building blocks ranging from a small rock to a huge boulder. Such building blocks of science cure many scientific problems at the time they are invented, but they do not answer to all questions. Therefore, they will allow having more answers from the next scientific achievements at a later time in the future. This alone may be interpreted that one of the most valuable

tasks of the educated human mind is *scientific exploration*. The following example will help to understand the scientific truth which solves within the human dimensions, certain problems, but does not answer to all questions:

Think about the eye glasses, which to a certain degree; cure the problem of vision. The eye glasses scientifically are based on three conflicting theories of optics: (a) geometric optics – light moves on a straight line, (b) physical optics – light moves on a waveform, (c) quantum optics – light moves as packages of energy. Although we do not know exactly how light moves we manage to improve the vision for those they have such a problem. In this example, we cannot answer to the question on *how light is moving,* because this question/answer, at the present, is out of human dimensions. The present state of evolution of human mind cannot provide an answer. At a later time, as science advances (evolves), we expect of having improved answers but not all of them. On the other hand, we cannot reject the eyeglasses because they improve the vision for those they have such problems. Therefore, eyeglasses and supporting scientific bases (scientific truth) are considered at the present valid, but expecting more scientific improvements in the future.

Nevertheless, scientific truth is based on studies of elements in *Nature* (i.e., light), of objects in Nature (astronomical, biological, etc.), the *laws in Nature* and the *rules in Nature* and also based on experiments to prove the validity of the scientific theories that explain different phenomena, conditions and structural elements of objects.

Laws in Nature are mandatory and absolute and all objects have to obey to them. If, for example, someone says “I do not recognize the *gravity law*” and falls into a cliff, is going to face directly the consequences of not obeying to the gravity law. Of Course, according to the previous discussion, the scientific

knowledge about the gravity law is dynamic and undergoes a constant improvement.

Rules in Nature, on the other hand, have exceptions and they are not absolute, but they are valid within certain tolerance limits. These limits are usually expressed by statistical parameters and can be called *variance limits*, *standard deviation limits*, *specification limits*, etc., (see Section 4.5). A very important rule in Nature is the *rule of equilibrium* or *rule of balance* for all Natural objects in order to have a *healthy performance*. This rule is fundamental to establish harmony with Nature and may include all other rules in Nature. Let us take, for example, the orbit of the Earth around the Sun, it is never the same, each year the Earth is following a slightly different orbit from all previous ones. We can observe a number of orbits of the Earth for a number of corresponding years and obtain an average value and a standard deviation value. Therefore, we may conclude that the optimum orbit of the Earth is the average of all orbits and the specifications, as designed in Nature to have equilibrium, are expressed by the standard deviation multiplied by a constant in order to obtain a certain probability confidence level. For example, if the Earth exceeds two times the standard deviation the average limits, then the Earth has 95% probability to get off bounds and it will either collide with the Sun, or, it will get lost in space. Today we have made a lot of observations of the orbit of the Earth and we know precisely all these limits. Other examples related to the equilibrium rule are that if things are in balance there is a healthy condition, while if things go out of balance, there is a sickness. If the stomach, for example, has more acids than necessary there is sickness, if blood pressure is below or above certain threshold limits, there is sickness, if the heart beats are out of bounds there is a problem and so on. To understand what we mean with the term specification limits in terms of probability, let us consider a light bulb which is designed and manufactured to

work 10000 hours without breaking down at a probability level 95%. That means, if we take 100 such light bulbs, then 95 of them will work at least 10000 hours of proper lighting (*normal performance*) and a maximum of 5 of them will break down before covering the 10000 hours of lighting (*error performance*).

The bottom of the line in this analysis is that we can perform observations to determine the design parameters set up in Nature thus estimating the specifications of normal performance, or error performance of Natural objects. The same procedure may also apply in estimating the specifications of artificial (man-made) objects. Design in Nature allows specification limits and rule exceptions in order to allow evolution to take place. If all natural objects would be absolutely perfect, then the Universe would be a routine fully determined system without evolution. Therefore, evolution is a part of Natural processes and it is mainly attributed to the standard deviation specifications governing Nature rules. It is important to understand that if things work out according to the rules in Nature we may say they have a normal or healthy performance, otherwise, if they work against the rules in Nature their performance is sick having an error and we must expect something very bad to happen like the Earth is getting off bounds. Aristotle in the following expression (The Nikomahean Ethics A-III) indicates the existence of rules in Nature:

… *τὰ δὲ καλὰ καὶ τὰ δίκαια, περὶ ὧν ἡ πολιτικὴ σκοπεῖται, πολλὴν ἔχει διαφορὰν καὶ πλάνην, ὥστε δοκεῖν νόμῳ μόνον εἶναι, φύσει δὲ μή* …
(The subjects studied in political science such as well-being and Justice involve much difference in opinion and are misleading, and while appear to be according to the law they are against the rules in Nature).

Taking into consideration that *human behavior* and all *human actions* originate within the human mind and executed by the human brain, it is important to understand and analyze the human mind error performance as designed in Nature so that to define the "*educated*" person. Therefore, the education system must understand, in terms of error performance, the optimum and acceptable mind state as designed in Nature and put its effort to work on the development of a virtuous person.

2.2 An acceptable and an optimum mind model

In this Chapter we will try to revitalize philosophy, as the mother of all sciences, to be able to support an acceptable and an optimum mind model related to the performance of the human mind. Revitalization is performed here, by using mathematics and statistics to analyze philosophical structures, thus moving one step forward from where such structures were developed by ancient Greek philosophers. This work is a continuation of work published by Hatzopoulos J. N., 2004 and Hatzopoulos J. N., 2008a.

The acceptable mind model is actually *modeling human error* and it is based on the Aristotle's book "The Nikomachaean Ethics, which in paragraphs B-6, B-7" defines the right and wrong limits as a *μεσότητα*[1] or *midway of virtue*[2] and if someone is performing inside this *midway* limits is doing *right* while if performing outside is doing *wrong*. This midway is a region (not a point) and it is, according to Aristotle, located between two extreme locations or *badness (vices)*, the one being towards a underestimation (*defect*) of virtue and the other towards an overestimation (excess) of virtue

[1] The Greek word *μεσότητα* means a region at midway with upper and lower limits. We use the English word *midway* to express this meaning.
[2]The Greek word for *virtue* is *ἀρετὴ* or *αρετή (arete)*

… *μεσότης δὲ δύο κακιῶν, τῆς μὲν καθ' ὑπερβολὴν τῆς δὲ κατ' ἔλλειψιν* ...
(midway is located between two badness (vices), the one being excess and the other being defect).

Therefore, concerning virtue, we can adopt as significant human error the outside of these limits human actions either they are in excess, or they are deficient to conform to virtue midway limits. Aristotle's example about courage is illustrating this definition of human error stating that

…*περὶ μὲν οὖν φόβους καὶ θάρρη ἀνδρεία μεσότης*…
(in midway between a coward and a provocative is the virtuous one (correct one) of courage).

Accordingly, we may say that "*in midway between a stingy and an overspending person is the virtuous one (correct one) of thrift*". Aristotle is also stating that the *effort* to maintain actions within the *midway of virtue* is the characteristic of a *virtuous person*, who is learning from mistakes and is trying to minimize them. In this regard, any person at any time (never is late) could make the effort to be virtuous. Aristotle is stating that *midway* is not a stable region for everybody and probably every person has a different view about the midway location

… *τοῦτο δ' οὐχ ἕν, οὐδὲ ταὐτὸν πᾶσιν* …
(this is not the same region for everybody).

Therefore, he is trying to use statistical methods to define this midway

… *τοῦ μέσου ἂν εἴη στοχαστική* …
(midway location is *stochastic*).

We could say that Aristotle is probably the first to introduce *stochastic processes* and the word “stochastic” in statistical methods is probably attributed to Aristotle as being the first one to use statistical methods and express them with this word.

It must be noticed that researchers at international level, interpret the Greek word “μεσότητα” not as “midway” but as “mean”, which is wrong because “μεσότητα” or “midway” comprises both the mean and the standard deviation. Therefore, there were no developments in statistics at that time and Aristotle used the word “μεσότητα” to express both statistical parameters the mean and the standard deviation. Today those they use the word “mean” commit a fundamental error in estimation because the mean without its standard deviation makes nonsense. If, for example, someone says that the mean distance between Athens and Rome is 10 Kilometers everybody will say this is a wrong estimation, but adding to the mean a standard deviation of 900 kilometers, then even 10 Kilometers it makes sense.

Therefore, the process to define the midway of virtue requires a wider public acceptance, which is obtained through the *democratic procedures* (Gross R. E., Zeleny L. D., Editors 1958), which are valid procedures only if the voters are educated thus having a *minimal bias* (see Section 2.3). In this way we introduce the *philosophical bases of democratic procedures*, something that is not regularly taught in the organized school.

Aristotle’s midway of virtue is actually a basic step towards *modeling of human error,* which is inherent in any human thought and action. Human error starts from a zero value and as long as it is within the midway of virtue limits, such action is being considered *virtuous* and *acceptably correct*.

Consequently, the error, after passing the midway limits, it may go towards infinity and the corresponding action is being considered *bad and wrong*. Aristotle (Politics 1323a) expresses such action

… *εἰς ἄπειρον ζητοῦσι τὴν ὑπερβολήν…*
(…they seek excess at infinity).

However, *acceptably correct model* regarding human mind actions, is the effort such actions to be constructive and therefore to perform within the midway of virtue *error limits*.

This acceptably correct model regarding human mind actions is the starting point of understanding the significance of education. With other words education without a scientifically derived *error model* for the actions of the human mind, has no meaning since *didactics* alone and resulting knowledge can be used both ways for *good actions* and for *bad actions*.

The other model concerning the *optimum human mind performance* is establishing a specific relationship between the *three basic mind components*, which define the *mind space*. According to Plato, the *mind space* is composed of three basic components which are: the *desire,* the *anger* and the *logic* (*reasoning*) (Plato, *The Republic* 435a – 445e) and Plato, *Phaedrus* (246a – 254e)). Therefore, as shown in Figure 1, mind space may be considered as a *three dimensional space* represented by a *three dimensional system* with axes desire *–D* (green colored axis), anger *-A* (red colored axis) and logic *–L* (blue colored axis).

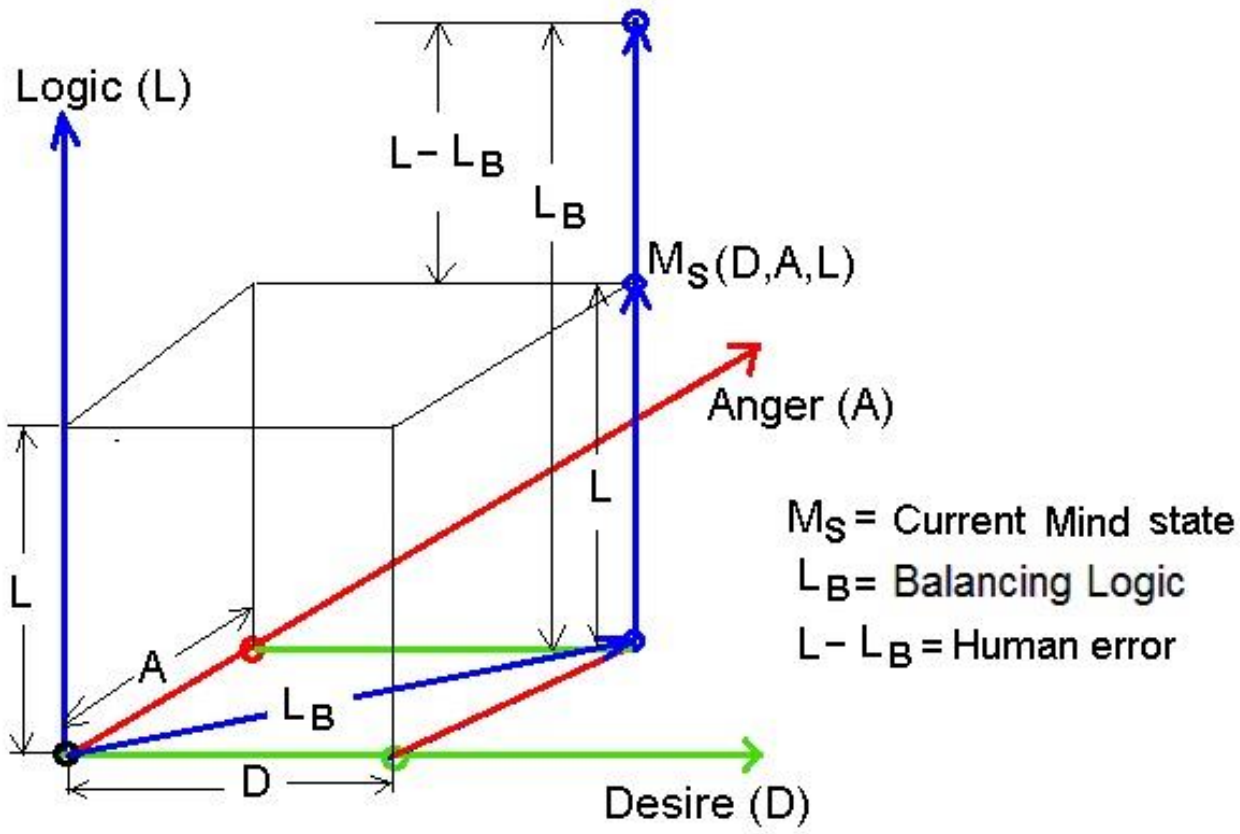

Figure 1. The three dimensional mind space with current mind state M_S(D, A, L) and Human Error the difference (L – L_B) with L being the current logic and L_B being the balancing logic of D and A.

Any mind state, or resulting action, corresponds to a set of values of these three basic components which define a specific point M_S in the mind space with coordinates M_S(D, A, L). Also in any three values of corresponding coordinates (D, A, L) there is a unique point M_S expressing a specific mind state. Notice that all three components can be quantized, because desire, anger and logic could be of any size (small, medium, large, etc.) expressed by numerical values. Precise quantization of D, A, L components is a matter of research to be done. Plato also defines the ideal situation of *optimum correct human mind state*, or, *optimum human mind performance*, where the logic must maintain an absolute check and balance between the two other components desire and anger:

… *οὐκοῦν τῷ μὲν λογιστικῷ ἄρχειν προσήκει* …
(logic must be the leader), Plato, *The Republic* (441e).

Plato's example to illustrate the absolute correct human mind state is shown in Figure 2, where the *desire* is represented by a *blind horse*, the *anger* is represented by a *crazy horse* and the *logic* is represented by the *coachman* who tries to move the car in the correct direction, the *virtue*,

… *εἰς τὸ μέσον ἑλκόμενος ὑπ' ἀμφοτέρων τούτων ἦλθε* …
(…was forced to the middle by both forces), Plato, *The Republic* 550a.

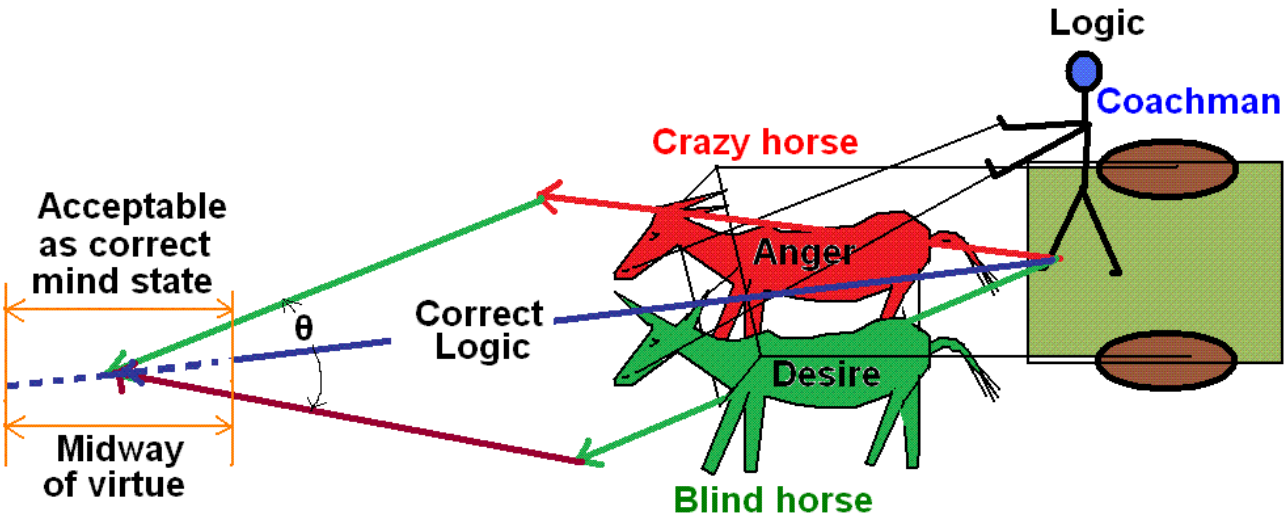

Figure 2. The absolute correct human mind state as defined by Plato, where the logic balances exactly desire and anger and the acceptable correct human mind state as defined by the Aristotelian midway of virtue.

We may conclude that there are two models concerning the educated human mind. The one is Plato's model dealing with the mind space where the optimum mind performance is represented by the rule of equilibrium in Nature, where the logic must balance desire and anger. We may call this model *internal balance of the person.* The second is Aristotle's midway of

virtue model, which on the one hand improves Plato's model by adding, a ± (standard deviation) to Plato's optimum value (logic value) as required by the design in Nature to obtain the midway and on the other hand it models the human error. We can put these two models together and see how this is going to work. This is shown in Figure 1, where logic *L* represents the current logic of a person and logic L_B represents the balancing logic according to current mind state of *D* and *A*. Consequently, *Human error* may be defined by Equation 1 as follows:

$$\textit{Human error} = L - L_B \qquad (1)$$

Taking into consideration that any human action contains human error, then, midway of virtue defines the threshold limits so that human error is insignificant and the resulting action is being considered as *acceptably correct*. Notice that these threshold limits define the boundaries of right and wrong and within these limits the *mind energy* is correct (*constructive*), this area is also defined by Aristotle as "*the midway of virtue*". Another combination of these two models is shown in Figure 2, where the *absolute correct logic* balances precisely desire and anger, while the *acceptable correct logic* may be less or more than the balancing one of a small quantity (threshold value) of human error to be defined.

A very careful examination in Figure 2, indicates that the two horses which pull the car create two forces A and D. A third force L_B is trying to balance these two other forces. In other words, we are talking about balancing forces as it happens in physics. Furthermore, this balance can be expressed by mathematics as follows:

$$L_B^2 = D^2 + A^2 + D.A.\cos(\theta) \qquad (2)$$

Accordingly, considering Figure 1, assuming a rectangular coordinate system the relation expressing the equilibrium of forces is expressed by the Pythagoras theorem as follows: (Hatzopoulos, J. N. 2009):

$$L_B^2 = D^2 + A^2 \qquad (3)$$

Equation 3, defines in the three dimensional mind space a surface, where all its points represent the optimum mind performance (absolutely correct) as shown in Figure 3. Adding two parallel surfaces (not shown in the Figure) one above and one below this surface at a distance defined by a threshold value (see below), then the acceptably correct mind space is defined.

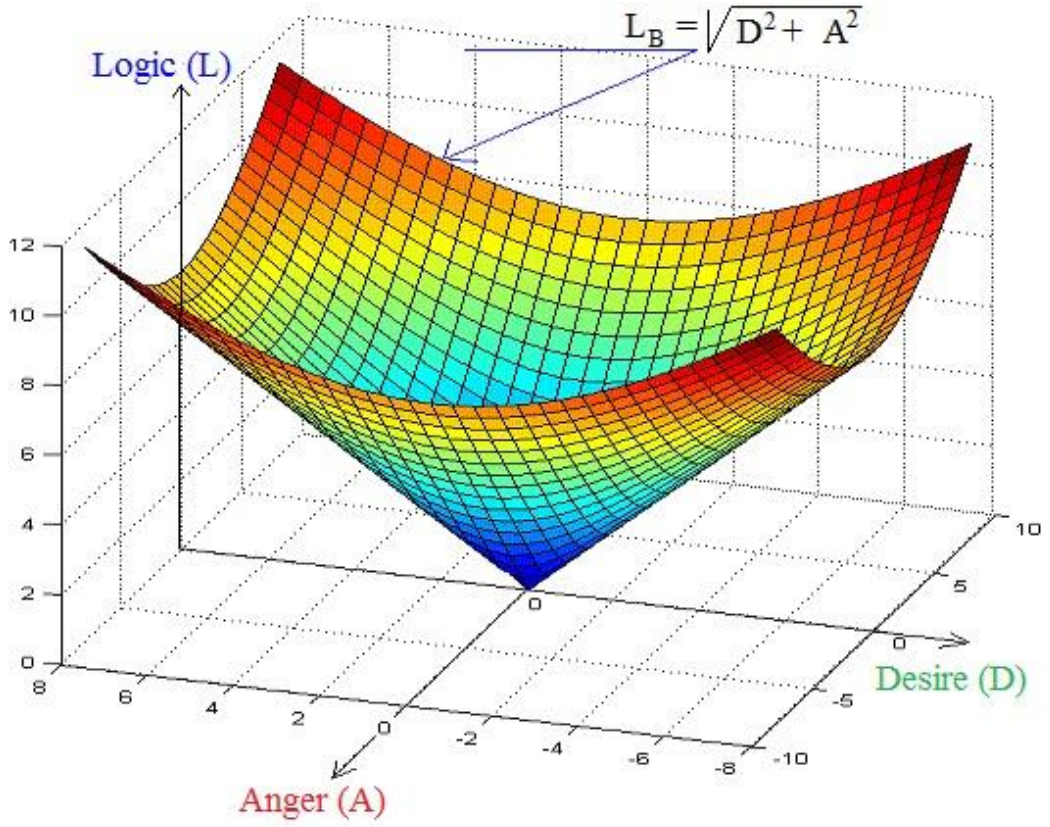

Figure 3. The optimum mind performance (absolutely correct) space according to Pythagoras theorem: $L_B = \sqrt{D^2 + A^2}$

Therefore, human error is mathematically expressed by Equation (1) and, as stated earlier, if it is within certain threshold limits defined by the Aristotelian midway of virtue it is considered insignificant and the resulting action is being considered as *acceptably correct*, otherwise it is significant being considered as error. Any action is the result of a specific mind state and in such action *correct and error coexist*. Human error can be quantified and its magnitude is varied from zero to plus infinity and from zero to minus infinity.

In conclusion, *education may be defined as the effort to maintain human mind performance within specified error limits as defined by Aristotle's midway of virtue*, thus being constructive concerning the *quality of life* for human society and working towards the *scientific exploration*. Consequently, from now on, any reference to the word education, educated, etc., we will refer to this definition and not just knowledge, or holding university degrees titles, etc.

2.3 Mathematical analysis of human error and acceptable limits

A way to illustrate quantization and magnitude of human error and its relation to the midway of virtue is shown in Figure 4. Human error is represented along the X - axis, which is expanded from zero to minus infinity representing error with negative sign expressing deficiency to approach correctness or virtue and from zero to plus infinity representing error with positive sign expressing excess to approach correctness or virtue. Taking into consideration Equation 1, then it becomes:

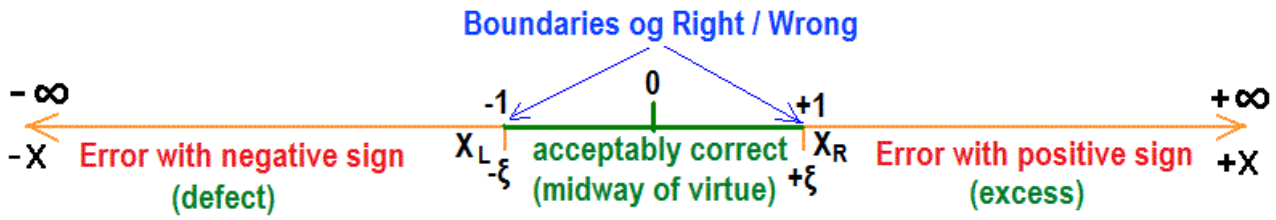

Figure 4. The error axis and the locations of acceptable correct and error.

$$X = L - L_B \qquad (4)$$

According to Aristotle midway of virtue, there must be two points (upper and lower limit) along the X-axis to indicate this region. Let us define these points as X_L and X_R as shown in Figure 4. Assuming ξ being a positive threshold value ξ>0, then:

$$X_L = -\xi$$
$$X_R = +\xi \qquad (5)$$

Therefore, the midway of virtue or the area of “correct” is defined between –ξ and +ξ, as follows:

$$-\xi \leq X \geq +\xi$$
$$X_L \leq X \geq X_R \qquad (6)$$

It is important to understand that in the same X-axis occur both right and wrong, correct and error. Therefore, we consider right or correct, the region in the X-axis defined by Relation (6). We consider wrong or error all other locations of the X-axis. Actually, all locations in the X-axis contain error, but because in the region defined by the relation (6) the error is below a threshold limit (ξ), this region is defined as the acceptably correct or correct region. This illustration expresses quite well the human error, which is inherent in all human thoughts and actions due to the neural structure of the brain.

We will try now to define precisely the value of the threshold limit ξ. Let us assume that the correct action is represented by the variable Y. Therefore, “error-X” and “correct-Y” are inverse proportional to each other. If, for example an action has a small error (X= small), then the value of its

correctness is large (Y=large), accordingly, if it has a large error (X= large), then the value of its correctness is small (Y=small). This inverse proportional relationship is expressed mathematically as follows:

$$X = 1/Y \qquad (7)$$

If, for example, we put Y=10 in Equation 7, then X=0.1and if we put X=100, then Y=0.01.

In Figure 4, the locations X_L and X_R are boundary locations, separating right and wrong, this means that on these boundaries X and Y must have the same value, (Hatzopoulos J. N., 2008b, pp. 247) or, X=Y and therefore the Equation 7 on these boundaries becomes:

$$X = 1/X \text{ or } X^2 = 1 \text{ and } X = \pm 1 \qquad (8)$$

However, the threshold value of ξ is mathematically determined as ξ=1. Accordingly, the boundary locations along the X-axis become $X_L = -1$ and $X_R = +1$ (see Figure 4).

To analyze further the human error, it is necessary to see how it is distributed along the X-axis. Actually, at any location x of the X-axis, we need to know how many people have an average error being of magnitude x. Therefore, we establish a Z-axis perpendicular to the X-axis (see Figure 5) to indicate the number of people who commit a mean error of magnitude x, where x is any value between minus infinity and plus infinity ($-\infty \leq x \geq +\infty$). The value along the Z-axis is called *frequency* because indicates how many times an x-value is repeated by corresponding people. Therefore, if a frequency value is divided by the total number of people, then it becomes a *relative frequency* value. In statistics, the area under the relative frequency distribution curve

represents the *probability*. Error distribution curves are developed in probability theory and are used in statistics. The difference between probability theory and statistics is that probability is dealing with a total *population* of a random event such as human error, while statistics deal with a finite subset of the population called *sample*. More detail about statistics is given in Section 4.5. There are many error distribution curves and to choose one to describe human error needs further investigation. In this work we adopt the *Gauss standard normal distribution* because it has a mean value of zero, which could be valid for human error if there is no bias and it has a standard deviation of ±1, which fits with the calculated values of right and wrong boundaries (see Relation 8). This distribution is expressed by an exponential function as follows:

$$Z = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} \qquad (9)$$

Where: π = 3.1415926535..., and e = 2.7182818284...

Equation 9, adds an interesting geometric characteristic to the above analysis by the fact that in the locations x = ±1, the distribution curve has turning points and therefore, changes the direction of the radius of curvature. This analysis is illustrated in Figure 5.

Further investigation to figure out if the curve in Figure 5 is a Gaussian curve expressed by Equation (9) can be done by asking a number of people (a proper sample) to indicate, or, vote the corresponding category of error (x-value). No matter how it appears strange that someone is able to accept, or, vote that commits a specific error, this happens and it is quite clear. For

example, the political parties declare clearly the category of error they belong to, the same thing happens to many social groups which declare their difference from other social groups. In this way the error or the bias of any social group can be relatively easy quantified and a diagram similar to the one shown in Figure 5 can be created.

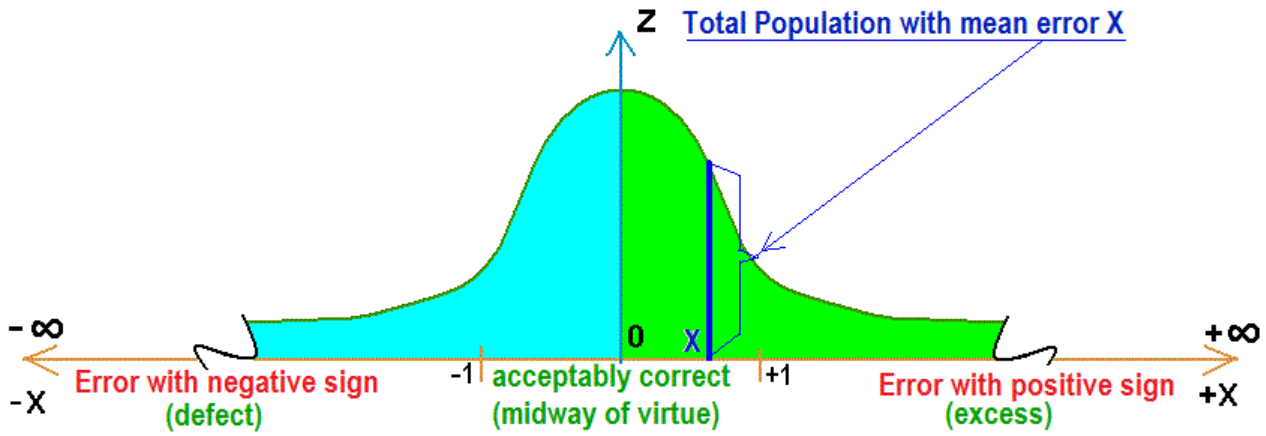

Figure 5. The error diagram of the ideal society showing the human error in the X – axis and the number of voters in the Z –axis.

Assuming that design specifications in Nature for human mind error performance are as shown in Figure 5, then this diagram represents the ideal society where in the midway of: ±1σ, there are 68.26% of virtuous human actions and therefore correct. Within ±2σ, there are 95.45% of human actions and within ±3σ, there are 99.73% of human actions. However, if 68.26% of human actions are accepted as correct, then an additional of 31.47% of human actions, which are between ±1σ and ±3σ, are in the neighborhood to be correct and their error is not too bad, it could be a ticket for an illegal parking, or overworking etc. In contrast, human error beyond the ±3σ that corresponds to 0.27% of the Earth's population, expresses the destructive power of human mind, which becomes gigantic when, tends to infinity, and that may have been approved by the design in Nature for the sake of *self-defense*. It is also interesting from the above analysis that Equation 8 (X = ±

1) defines the unit of measurement of human mind space denoted as 1σ, 2σ, 3σ, … with σ = ± 1.

Unfortunately, ideal society does not exist and the real society error diagram is not represented in Figure 5, but it is shown in Figure 6. This real society is composed by a large group of people to be located in the virtuous or, correct region and many other smaller groups of people spread throughout the diagram with various biases. It must be noted that the *destructive energy* of a group of people is equal to the number of people in the group multiplied by the bias of the group as follows:

$$DHM = E_i.\mu_i \qquad (10)$$

Where: DHM is the destructive energy of the human mind, E_i is the number of people in the group, μ_i is the mean value of the error, or *bias* in the group.

Considering that bias works as a lever and it may be of a magnitude approaching infinite, then it is evident that a small group of people could accumulate a tremendous destructive energy.

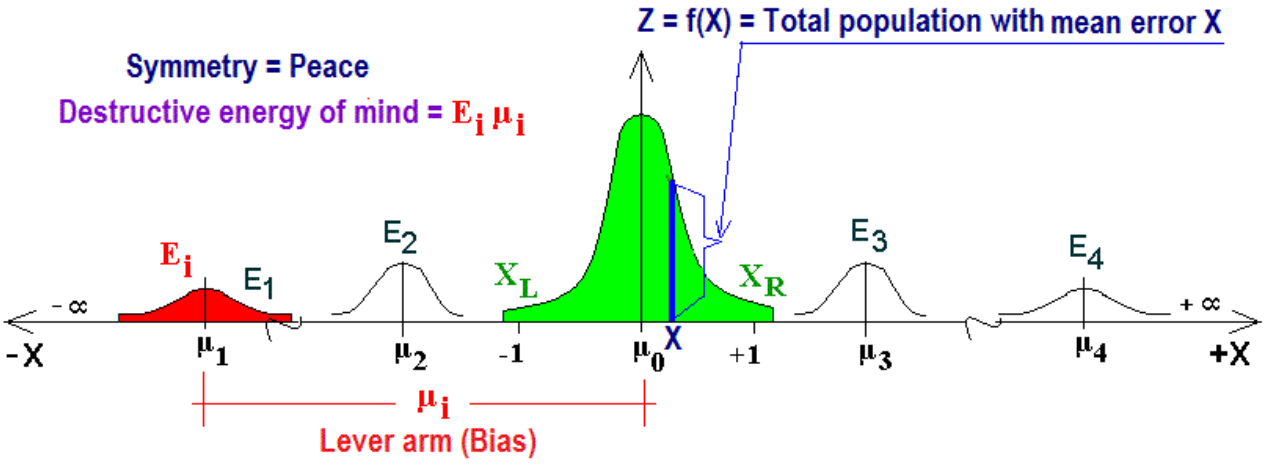

Figure 6. The real world with groups of people E_i having corresponding biases μ_i.

Usually groups of people with opposite biases move into conflict, collisions and wars and *peace* may be obtained if they have equivalent destructive energy. Usually *world peace* is obtained if the error diagram in Figure 6 has a symmetric structure; therefore, the *Equation of peace* may be expressed mathematically as follows:

$$\sum_{i=1}^{n} E_i \mu_i = 0 \qquad (11)$$

Where n is the number of groups with significant bias.

Furthermore, if there are small biases and symmetry, there is a *stable peace* state, while if biases are large and symmetry, there is an *unstable* state of *peace*. Stability of peace depends on the magnitude of the value K in the quantity:

$$K = \sum_{i=1}^{n} | \mu_i | \qquad (12)$$

If K is big, then there is unstable peace, if K is small, then there might be a stable peace.

Bias is responsible for most bad things happening on this planet such as the deterioration of the environment and the social injustice. As stated earlier DHM is probably allowed in Nature for *self defense* and therefore, if it is used for different purposes, it is against the rules in Nature with unpredictable consequences.

Education on the other hand, has to explain to the people the structure of the real society today and help them to understand that peace, quality and

prosperity in life can only occur if all groups of people minimize their biases. The best way to do this is to understand and evaluate the reasons groups of people maintain such biases and consequently to create motives and peaceful ways to minimize them. People must also be educated to evaluate correctly the destructive energy of small groups and take the necessary measures to defend against their destructive energy.

To finish with the error analysis, it will be an effort to draw the function of Equation 7, which relates the correct (Y) with the error (X). Drawing is shown in Figure 7, where:

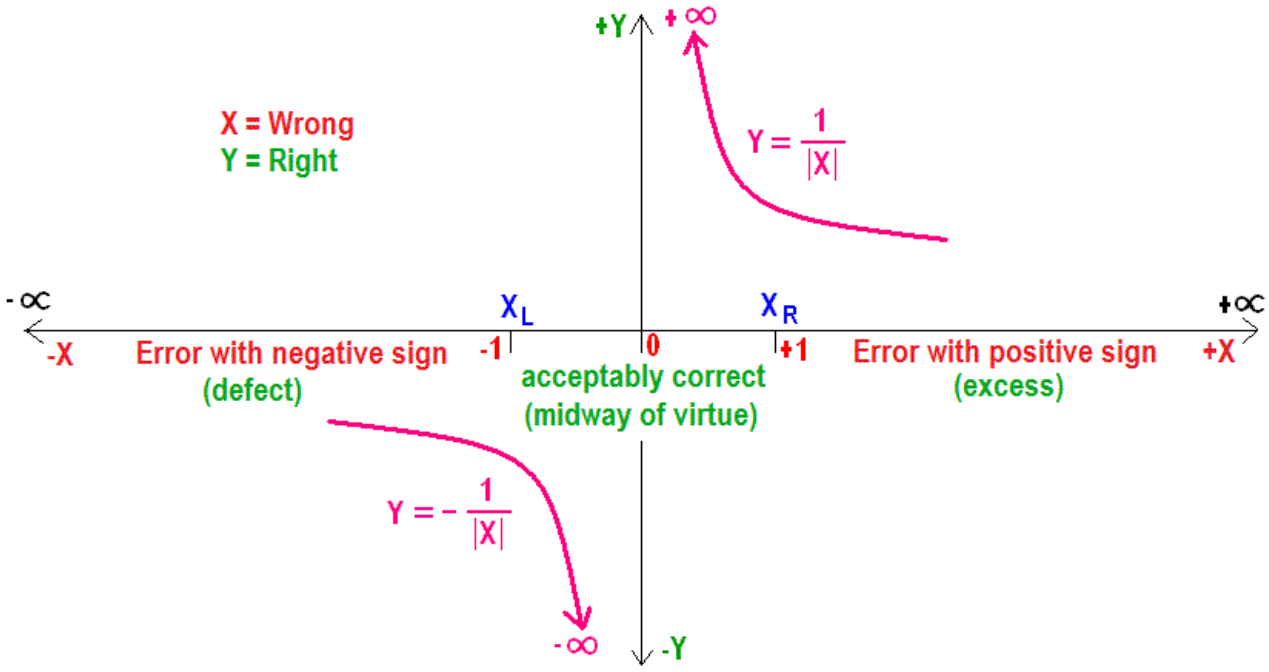

Figure 7. The correct/error function in the location X = 0, reveals an entity with zero error and a virtue which is expanded from minus infinity to plus infinity (Hatzopoulos 2009).

If X takes values from minus infinity towards zero, then Y moves towards minus infinity. If X takes values from plus infinity towards zero, then Y moves towards plus infinity. In other words, if there is an entity of having zero error at all corresponding actions, then the virtue or the correctness of this entity are expanded from minus infinity to plus infinity. The question is “is there such an entity”?

This analysis can help to understand that any effort to search for the attributes of a Supreme entity must be focused on the fact that such an entity must have no human weaknesses and as such ideal must be used to educate people. Nevertheless, it must be noted that the quantification of the “correct” or, “virtue” has only theoretical meaning in the process to study the behavior of the wrong/right function and having in mind that for any human thought, action or performance, wrong and right coexist. In practice, “correct”, or, “virtue” cannot be quantified and if, for example, someone is judged from the justice system as innocent, is not judged as more or less innocent, while if someone is judged guilty, could be judged more or less guilty (offense, felony, crime, etc.).

3. The environment and human intervention - impact of education

As stated in the introduction human brain, which hosts human mind, is a neuron based structure and holds genetic software instructions. On the other hand, genetic software for mind performance is under continuous development, affected partially by inherent genetic software by birth, reflecting the talent of the individual and partially by the environment the individual is living. All kinds of environmental concerns may be included as affecting the education of a person. Unfortunately, human intervention is doing a lot of damage to all environments by destroying their naturally balanced character and their aesthetics. The resulting impact of the education is that within a healthy (balanced) environment, people with educated character can be easily found, while in a sick environment (imbalanced, ghetto), it is quite difficult to find educated people. Furthermore, it is expected that next generations are going to face a quite degraded environment such as: climate change, planet overheating and deterioration of aesthetics, imbalance on news media information, imbalance concerning social justice, imbalance on political and economic developments and imbalance on developing human mind with optimum constructive performance within the official school system. Therefore, it is very important the education system to reform itself, so that under any circumstances, in terms of environmental concern, to put the effort on developing educated virtuous people.

3.1 Natural - Land, sea, atmosphere

Natural environment includes land, sea and atmosphere which must be preserved in healthy conditions and aesthetics. A healthy natural environment is characterized by its biodiversity, while a degraded natural environment is

characterized by the dominance of nasty and human cultivated species and desertification process. Usually, human intervention in the natural environment destroys the existing equilibrium and creates various loads in an effort to exploit environmental resources in a non sustainable manner, thus creating non reversible conditions leading to degradation and desertification. The reason this happens is the lack of education, which allows the *desire* (for more profit) of the mind component to exceed corresponding *logic* component for sustainability and quality in life, thus creating a quite large human error (see Equations 1, 4) revealing the destructive energy of the human mind. Aesthetics involve the natural beauty of landscapes, the diversity of landforms and the diversity of landscape, of sea world and of atmospheric conditions.

Concerning the land environment, human intervention leading to degradation involves deforestation for urban development and agriculture, excessive loads with nutrients, fertilizers and pesticides, extermination of flora and fauna species, uncontrolled pollution. The *atmosphere* is getting the most violent and rapid degradation of the destructive energy of the human mind, where the *desire* for quick and easy profit, for a few people, they pump out the inside the Earth petroleum deposits to use it as an *energy resource* without any care that they load with excessive carbon dioxide the atmosphere. Parallel to those they influence the political decision makers not to develop alternative energy resources such as Sun, Wind, Sea waves and other soft energy resources. The sea environment is also facing a lot of pressure in terms of pollution with loads of liquid wastes, industrial wastes, heavy metals, dangerous chemical damping and nuclear waste dumping. In terms of resources, it is facing an invasion of dangerous species and extermination of certain species due to overfishing activities (for more profit) and due to climate change.

3.2 Cultural

Cultural environment is responsible for many positive things in human education related to national values, national history and national civilization. National identity makes a person to be proud about the cultural developments of the ancestors and to be protective of homeland national culture and national values against destructive invaders. On the other hand, cultural developments within a nation for thousands of years, has evolved culture to a point of perfection and it is a crime against humanity the destruction of such nations. Therefore, diversity of cultural developments makes global culture stronger and for this reason we must protect and preserve nations and national values. Unfortunately, today, as mentioned earlier, we are facing the worst kind of globalization, which is slowly but constantly destroying the nations and national values, perhaps based on certain religious scripts, against humanity.

3.3 Social

Humans are social beings and they are organized into families, neighbors, villages, cities, counties, regions, provinces, states, nations, wider coalitions and other groups with same interests in certain things (i.e., those they like hiking). Social developments, and in particular education, help people to maintain equilibrium according to rules in Nature on living together with minimum conflicts and overlaps to avoid tension thus improving and optimizing social relations. Social relations of educated people, help to improve culture, organize cultural events, work together on all kinds of projects, protect the environment and help each other to improve the quality in life. However, the real social environment of people tends to create social

groups as shown in Figure 6 with different biases getting them involved in conflicts and wars. Also, persons growing up in a specific social group, usually inherit the bias of the group. For this reason social sciences must work out on scientific methods to minimize such biases.

Consequently, social science, which is responsible to study social relations, is limited in studying human behavior by taking samples of groups of people and analyzing them. They are not interested as much as they should in studying the deeper scientific reasons which cause such a human behavior, so that to provide optimum solutions where problems occur. Therefore, this present work provides the scientific basis to get involved on deeper reasons they cause a particular human behavior. Such bases include the neural structure of the human brain, the two models of Plato and Aristotle on human education and the reunification of philosophy with sciences, which will help to develop ethics based on the equilibrium rule and harmony in Nature . These scientific bases can also be used to promote and reform most human science fields.

3.4 Economic

Although the *economy* has evolved into a very complicated process, quality of human life can be achieved by a very simple economic process. The economic environment I grew up (1948-1960), as an example, was based on agriculture in a mountainous area around the village Komiaki (about 1200 inhabitants) in the Greek island of Naxos. Each family would produce wheat for bread, olive oil, wine, potatoes, beans and several other fruits and agricultural products. Consequently, they would sell some of them to buy other products they would not produce such as spaghetti, rice, sugar, etc. Each family would have a couple of goats for the milk and several chickens

for eggs and meat. Very few of the people had money in the bank. My mother before getting married and before WWII was working as an internal home aid for a doctor at the center part of the island and later in Athens and all money she earned she put in the bank. Consequently, during the German occupation of Greece, the invaders took all this money from the Greek working people to support their military operations. Therefore, people in the village did not trust the banks. People had always a balanced budget and in very rare circumstances they will borrow money, especially when extreme weather conditions would destroy their production. The village did not have transportation system and roads for cars and the transportation was performed by mules and donkeys through mountain trails. At that time, all solid and liquid wastes were fully recycled to produce either food for the animals, or manor to be used as fertilizer. There was zero atmospheric pollution maintaining a very healthy natural environment. Social life in the village was at very high levels involving numerous social activities, festivities, carnivals, religious celebrations and other activities. People would work hard in the farms without any machinery aid, this helped them to be in a very good shape bodily and spiritually, they were very happy people singing at work, joking and dancing at free time.

Therefore, present complicated economic environment is totally out of balance and affects education the worst possible way. The worst example of a total imbalance is the economic crisis started in the year 2008 in the US and was transferred in Europe, when a bank (Lehman Brothers) declared *bankruptcy*. I am not an expert on complicated economic processes, but I know that all banks have highly qualified economic advisors to help them to stay on the safe side in business without taking unnecessary risks, and high risks through a gambling process. The same thing happens to the governments, they have highly qualified economic advisors to help them to

establish through legislation, regulatory laws that would not allow such a colossus bank to go bankrupt. Why and how this bankruptcy took place, there are tons of ink on thousands of pages in various *highly reputable publishing places* and the more you read them, the more you get confused. The total imbalance in this situation can be focused on several key element structures such as: bank management, legislation, justice system and the press, which affect public opinion and in particular save deposits and shareholders. It is obvious that if people involved in these key element structures, were educated nothing would happen and the crisis would be avoided. On the contrary, uneducated people in one or more of these key element structures, using the destructive energy of their mind would do the damage. This is interesting to understand how important is, a person in a key position beyond university degrees and titles, to be also educated.

Such an out of balance economic environment is against the equilibrium rules in Nature and the only thing to expect is a continuous degradation of quality in human life. The worst thing is the influence young people get, when growing up in an economic environment like this.

If educated people had to decide what is to be done to avoid such crises, of course, it would not be appropriate to go back to 1950-60 of Komiaki of Naxos economic system. They can, though, take several examples of this system such as the balanced budget of every family, which could inspire governments to target a balanced budget. Sustainability and environmental protection would be another example. The most important example would be simplicity on any kind of transactions so that the public, which pays the price in all *crises*, to be aware of what is going on in order to support through the democratic process actions for avoiding such crises.

Educated people such as Plutarch, is telling the following regarding borrowing money: (829f)

… ἀλλ΄ ἐνδεικνύμενον τοῖς προχείρως δανειζομένοις, ὅσην ἔχει τὸ πρᾶγμα αἰσχύνην καὶ ἀνελευθερίαν καὶ ὅτι τὸ δανείζεσθαι τῆς ἐσχάτης ἀφροσύνης καὶ μαλακίας ἐστίν. Ἔχεις; Μὴ δανείσῃ, οὐ γὰρ ἀπορεῖς. Οὐκ ἔχεις; μὴ δανείσῃ, οὐ γὰρ ἐκτίσεις.
(… to those they easily borrow money, that means they are slaves and not in shame and that borrowing is the worst level of not thinking and being soft minded. If you have money, do not borrow, you are not a poor. If you do not have money, do not borrow, you cannot pay back).

The other worst thing that happens in our days is the consideration that with money you do everything being like God. On the other hand, money is good if they represent real product value or human energy and help to obtain the necessary needs a person is facing in having a decent life within certain tolerance limits so that not to have deficiency or tremendous excess.

3.5 Political

The political environment in the 21st century is another environment with many elements out of balance. Democratic procedures indicate that people are the ones to decide about the fate of a nation, the US constitution starts: *We the people…*, but the question is: Does this happen in reality? We all know the answer is “No”. There are numerous examples with governments being elected by promising to apply a specific political program and they do totally different things during the course of governing a nation. President Reagan in US, for example, was elected to add an amendment to the US constitution for a balanced budget and he failed, although he tried hard along

the 8-year of his career as a US president, to do so. This imbalance to the US political system has increased the public debt to a very dangerous point for the US nation.

It is a general practice that politicians in most nations are elected because of their financial status, or even worst, because they are supported by strong financial individuals and groups. Therefore, the imbalance has to do that they are not actually elected to protect public interests, but to support the interests of strong financial groups. These phenomena take place in most nations and democratic procedures are not working to protect public interests as they should, but they protect the interests of individuals and groups with financial power. These groups and individuals thus become financially stronger against people's living quality. This situation degrades democracy, which becomes a typical system used by groups and individuals to provide coverage for actions against the rules in Nature and therefore, for imbalanced actions against the public interests, in order to multiply their profits.

The real problem that creates an imbalanced political environment is the lack of education in the general public resulting to a voting for uneducated politicians. Questions waiting answers could be: who is responsible the general public is not educated as much as they should? What the Universities do about this? Who benefits from an uneducated public? Such questions and more answers to corresponding questions will be an effort to be given in following Sections and Chapters.

First of all let us make it clear as to when a political system is a democracy and when it is a republic or oligarchy. According to Aristotle (*Politics*) democracy exists if the government is randomly drawn from a pool of candidates giving equal probability to all citizens, while in oligarchy or the

republic, the government is elected. Therefore today no country in the entire world has democracy but mostly it is an oligarchy or republic. That means, those they fight wars to help countries to establish a democratic regime are liars. The USA system, for example, is not a democracy, it is a republic. The political environment in a republic or oligarchy system is based on a variety of political parties, where each one of them provides a different program usually with a different biased approach. Therefore, a specific bias is the characteristic of a political party. Unfortunately, no matter how good the ideology a political party is based on and how good the intentions of the party followers are, there is always a danger that the leading team of the party is more serving the interests of a few financial supporters and less the interests of the general public.

A proper globalized process would be performed by educated people, trying to achieve a total political and economic reform, where a person must try to live a simple, low profile and best quality life (see Section 4.3). People must understand through education that it is not the excess financial status that gives quality of life, but the ability to appreciate the invaluable goods provided by Nature, such as, sunshine, air, water, fertile ground and the planet Earth environment, so that humans must develop the ability to respect and apply this equilibrium rule and live in harmony with Nature. Such political reforms would establish a democratic process by specifying a minimum qualification standards for someone to be a candidate for a particular government position. Then all candidates with such qualifications will submit a file to the court for evaluation and if they fulfill the standards, they will be entered into a pool and the government position will be filled up through a random drawing from the pool. In this way any citizen with minimum qualifications has equal chance to become president, governor, legislator, senator, counselor, etc., without spending any money or getting any support from sponsors.

3.6 Religious

The religious environment and its impact on the general public are quite interesting. People usually have many weaknesses and many times due to these weaknesses they face severe problems, especially accidents, handicap, illness and depression. Many such problems could accidentally show up without any warning and make people go through severe suffering. In a situation like this, people are looking for a fixed point to be held otherwise they undergo the worst type of pain and torture. In occasions like this science is offering medical, psychological and psychiatric methods, but science in general is reluctant in providing a fixed point so that the suffering person will be held. However, religion provides such a fixed point which can be named God, Lord, a particular saint, prophet, etc. In this respect, religion is indeed giving a significant help to people who undergo such suffering.

Another positive thing about religion is that it carries a great amount of culture and tradition. Religious culture is contributing from daily to yearly around ceremonies, occasional ceremonies for birth, marriage and death and many other instances. Such cultures, traditions and celebrations from various religions help to create a cultural environment with a diversity of cultures.

Religions are based on the faith of certain written text content or scripts, which were either, given directly to humans by God, or were given by a process called revelation. Revelation process usually includes the selection by god of one or more trusted persons and usually through their dreams, god's will is revealed to them and the trusted person(s) transfer god's will on the script. Faith alone, on the other hand, virtually neutralizes human logic and therefore, human mind, thus creating the proper ground for human exploitation by clergy. Plutarch, a Greek philosopher of 1st century A.D., was

aware of this and called those explaining everything through god *superstitious* people. Actually Plutarch was defining a virtuous faithful person to be laid in the midway between the atheist and the superstitious. Clergy has a long tradition of seeking through religion political and economic power.

However, religions are based on metaphysical explanations about most unanswered philosophical questions. Such explanations have to be accepted by people by faith and not by the scientific process. Of course, religions claim that metaphysics is a scientific process and indeed it is, if and only if, it is used very close to be explained by reasoning (logic). Pythagoras (see Section 5.1), for example, who was using metaphysics, was working with just a single metaphysical entity called Έv (One). This entity, according to Pythagoras, provided humans with a number called unit. With no more metaphysical stories, Pythagoras managed to establish the geometrical structure of the Universe using three numbers (π, Φ, unit). Where π = 3.14… (Provides the shape – circle, ellipse, etc.), so called golden number Φ = 1.618… (Provides the ratio to obtain harmony), and the unit provides the scale. It is important to understand that the geometric structure of the Universe without the *scaling unit* it is a chaos with its objects having no order, size and magnitude. For this reason, metaphysics are used just for getting the scaling unit. On that respect religions make an abuse of metaphysics because they are using a lot of lengthy metaphysical stories far away from logical explanations. Such metaphysical stories are quite different among religions, thus creating severe biases of faithful people. A person growing up in a certain religious environment is forced to accept all such biases and it is quite difficult to overcome this after growing up because the neural brain cells holding this information are already developed.

The problem with the religion is that most religions declare and claim that the God (and associated scripts) they believe is the only true God. Therefore, Gods of most other religions are fake Gods. Such a declaration creates fanatics, conflicts and collisions among some religion followers. Fanatics, conflicts and collisions are also created within the same religion from the misinterpretation of same scripts, thus creating various sects and heresies. Due to fanatics on different religion biases, many wars and many terrorist activities are related to such religion believes. On the other hand human history is plenty of examples where political, judicial and economic power is associated with religion and some geostrategic plans are using religion to manipulate people by the method of *divide and rule*. Also specific religions are having within their scripts political, judicial and economic issues to create a religious state, while their expansion is based on wars and genocides against of those they consider as unbelievers. Other religions try to apply certain prophecies mentioned in their scripts such as the destruction of nations, which is attempted in our times. A common target of most religions is to dominate the world and this was attempted through Christianity during the dark ages but it failed, while Islam seems to do a lot of progress towards this direction and of course Zionism is always trying the same thing.

Therefore, some things related to religions are good such as faith within the midway of virtue limits and culture. Some other things are bad such as political, judicial and economic involvement, crimes against humanity such as genocides, destruction of nations, terrorist attacks, wars and crimes against civilians. However, religious leaders must understand that they have to make their own reforms by changing, if necessary, some parts of the scripts, particularly those ones being against humanity. They may also minimize religious biases and as far as metaphysics are concerned, they may try to get as closed to scientific reasoning as possible. They can improve their

theological issues if they use some mathematics, for example, try to understand the analysis performed based on Figure 7, where the Supreme Entity has zero human weaknesses. They can further strengthen the cultural part of the religion and this way have a greater contribution to the society.

4. Education of Educators

A very important element in education is the education of educators. In most instances educators are far away from being educated and consequently, they cannot produce educated students. There are several things modern educator must be knowledgeable and aware of, such as:

- Education is the effort to develop an acceptably optimum constructive performance of the human mind as discussed in Chapter 2. More about philosophical aspects of education the reader may find in a book named “PAIDEIA” written by Werner Jaeger, 1945.
- The human mind is hosted within the human brain and it is a *neuron based structure,* which means it is susceptible to *programming*.
- Philosophy as the chief science containing all sciences is used to help students *to develop analytical rigour and the ability to criticise and reason logically on any matter* (former message of University of Oxford Admissions).
- *Mathematics*, especially *geometry* and *statistics*, are used to train human mind, expand its capabilities and understand the *rules in Nature.*
- *Computer programming*, is used to develop the attitude: of *being smarter than the machine* and transmit this attitude to the students.
- *Aesthetics* are developed as external and internal beauty and this sense is transmitted to the students.
- *Justice* is conforming to the equilibrium rule in Nature.
- *Agriculture* is developed to control the most valuable material, such as food, to support quality in life.

4.1 Artificial Neural networks

Research in the field of *Artificial Neuron Networks* (*ANN*), emanated from the demand to produce artificial systems, capable to think and do intelligent processing, similar to the function of the human brain (Fausett 1994) in order to handle complicated and *chaotic* problems. In this respect, there is no widely accepted definition of ANN. According to Haykin (1994), a neural network is a massive parallel *distributed processor,* which has the natural tendency to store empiric knowledge and make it available for use.

An ANN has two common characteristics with the human brain:

- The knowledge is acquired by the network through a *learning process*.
- The strength of contacts between the neurons, known as *weight* (*synaptic weight*), is used for the storage of knowledge.

Zurada (1992) considers the ANN systems as natural cell systems which can acquire, store and exploit empiric knowledge. Fausett (1994) defines the ANN as a system of information processing which has certain common characteristics with the biological neural networks.

ANNs have been developed as a generalized mathematical model of human knowledge based on the following characteristics:

- Information processing is performed within simple elements named *neurons*.
- Signals are moved between the neurons via *contact nodes*.
- Each contact node has a *weight,* which in a typical neural network multiplies the signal that is passing through it.
- Each neuron applies an *activation function* (usually not linear) in the input data (*weighted sum* of *input signals*) to calculate the *output signal*.

In Figure 8 it is presented a typical neuron Y which accepts input data from neurons X_1, X_2 and X_3 via three contact nodes w_1, w_2 and w_3. The input data in neuron Y are in this case the sum of signals from three neurons X_1, X_2 and X_3, that is to say:

$$y\_in = w_1 x_1 + w_2 x_2 + w_3 x_3 \qquad (13)$$

A more complicated ANN (see Figure 9) is composed of many neurons distributed in more than one level of processing, which are named *hidden levels* or *hidden layers*. Thus the output of each neuron is the input for certain others with which it is connected. The weight value implies the *strength of the connection* between the two neurons.

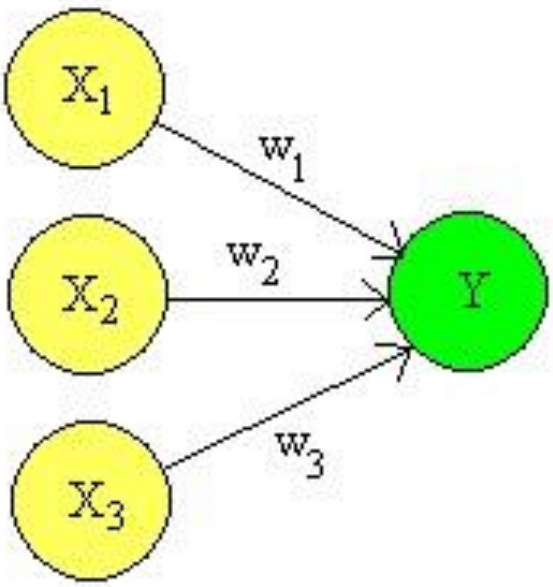

Figure 8. A simple ANN with one level of processing.

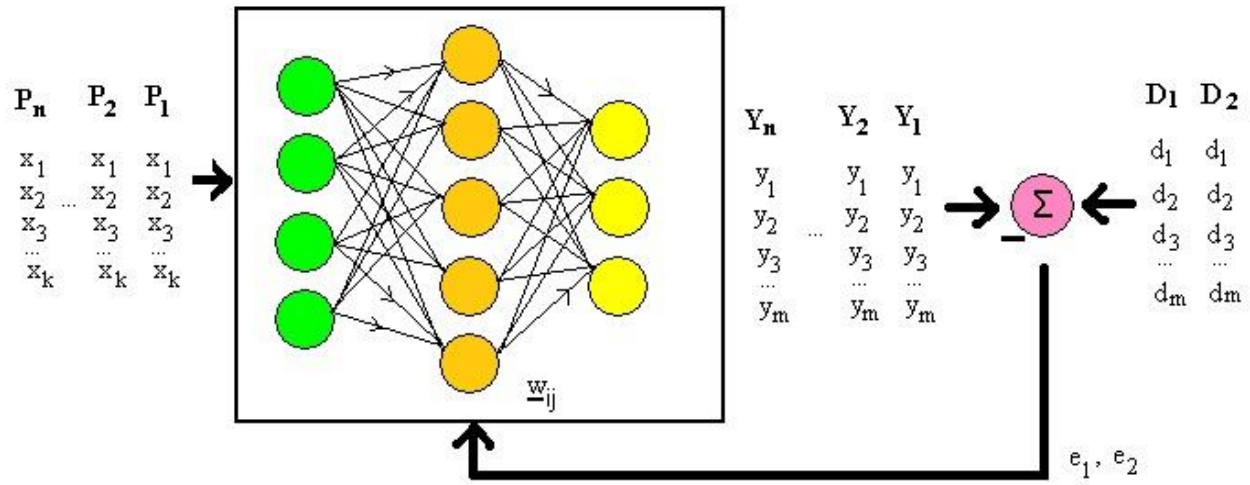

Figure 9. The learning mechanism of an ANN with one hidden layer.

An ANN is a system. A system is a structure that receives an input, process the data, and provides an output (see also Figure 15). The input consists of a data array, e.g., image file. In Figure 9, there are sets of different input arrays like P_1, P_2, … P_n sets, being fed with one set at a time. Accordingly, there are output sets Y_1, Y_2, … Y_n corresponding to each input set. The ANN is an *adaptive system* and can be trained to perform certain tasks. In Figure 9 the ANN uses two input sets P_1, P_2, with known correct results D_1 and D_2. In this particular case the corresponding output results Y_1, Y_2, are subtracted from the corresponding correct results D_1 and D_2, and the *error differences* e_1, e_2, are used to feedback the neuron structure in an iterative *learning process* and train it to improve its performance. The learning process is based on the adjustment of *internal parameters* (*learning rule*) mainly being the adjustment of the weights w_{ij}, (see Figure 8) so that the y_in signal to the next neuron (see Equation 13) is improved. The process is repeated until the error is minimized below a *threshold limit*. As one may understand this process is heavily based on the quality of the data and for this reason the data must be of a predetermined quality with known precision.

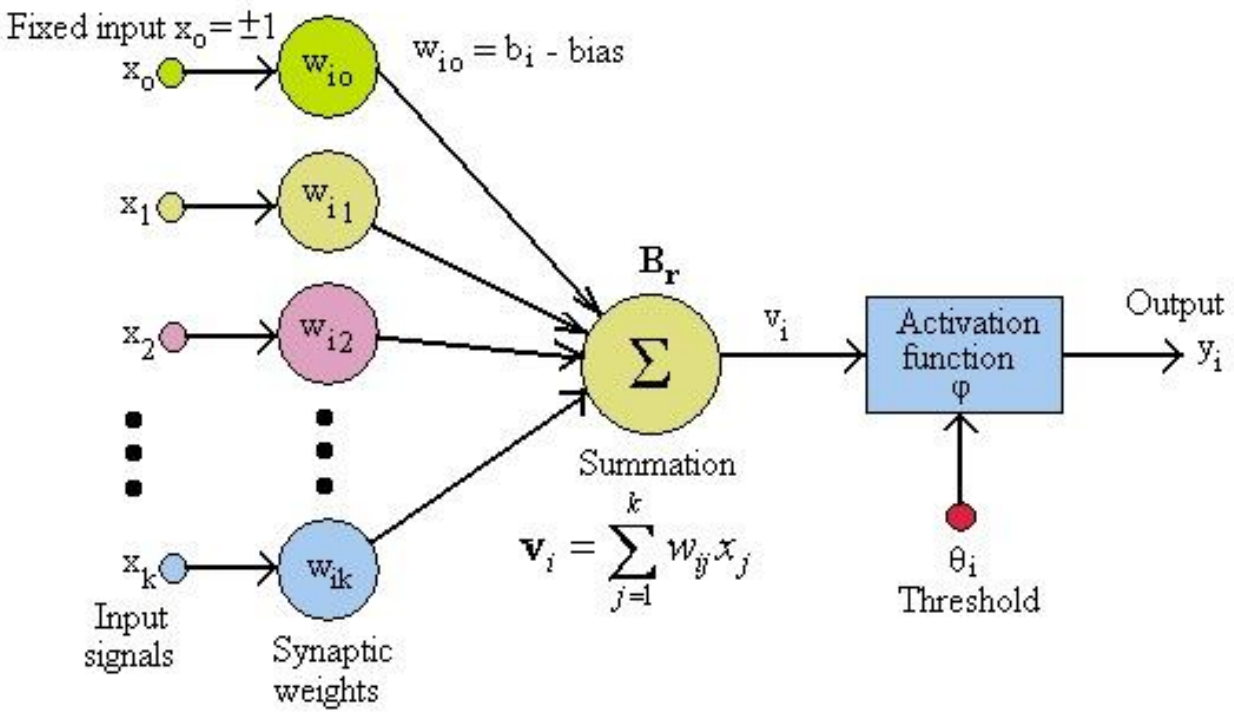

Figure 10 Part of the internal adjustment mechanism of an ANN, source: Vasilakos et al, 2007.

In Figure 10 is shown a series of weights called *synaptic weights* each one representing the weight at current training stage "i". This weight takes an initial (random) value at the first run of training and in each subsequent run is modulated by the feedback of error values so that the next stage error to be minimized. The first input value x_o is a fixed value, usually being ±1, the corresponding weight value w_{io} is a constant value b_i called bias and is adjusted properly in each run. All layers may have a *bias unit* except the output layer. Taking the junction B_r, which is located in the next layer of neurons, one may observe that it is getting several input signals which are summed as shown in Equation 13 and the resulting quantity v_i is adjusted through an activation function φ to an output value y_i. This adjustment also involves a threshold limit θ_i, if v_i is smaller than θ_i, then the activation function φ is used to compute the output value y_i, otherwise y_i is left unchanged.

Usually the activation function which must be monotonic and differentiable is approached by a *sigmoid* or *logistic function* f(x), (see Eq. 14) which usually gets an output value between -1 and +1.

$$f(x) = \frac{1}{1+e^{-v_i}} = \frac{1}{1+e^{-(x_o + w_1 x_1 + w_2 x_2 + ... + w_n x_n)}} \quad (14)$$

The design of a *feed forward* ANN involves choices about: *topology*, the *trigger function* or *performance function*, *learning rule* and the criteria for stopping the *training phase*. Topology involves the number of layers, the number of neurons in each layer and the interconnections between neurons. A simple case involves one input and one output layer (Figure 8), while more complicated ANN involve one or more hidden layers (Figure 9).

An example of ANN is to estimate the fire ignition danger, (Vasilakos et al, 2007, 2009), where a total of 17 input variables was used to train three different ANN. In Figure 12 is shown four input variables in *fuel data* used to train the *fire hazard index ANN* and data from same variables are shown analytically in a raster form in Figure 11. *Fire ignition* is a rather *chaotic problem* and the known data which were used for training were historical data from 57 past fires.

In Figure 11 is shown a geographical area subdivided into four raster cells, for illustration purposes (the real project had about 10000 raster cells), and within this area there are four layers of data namely *fuel model*, *fuel moisture*, *elevation* and *aspect*. These values, as shown in Figure 11, are normalized to be in the range between zero and one and in the same Figure are shown how

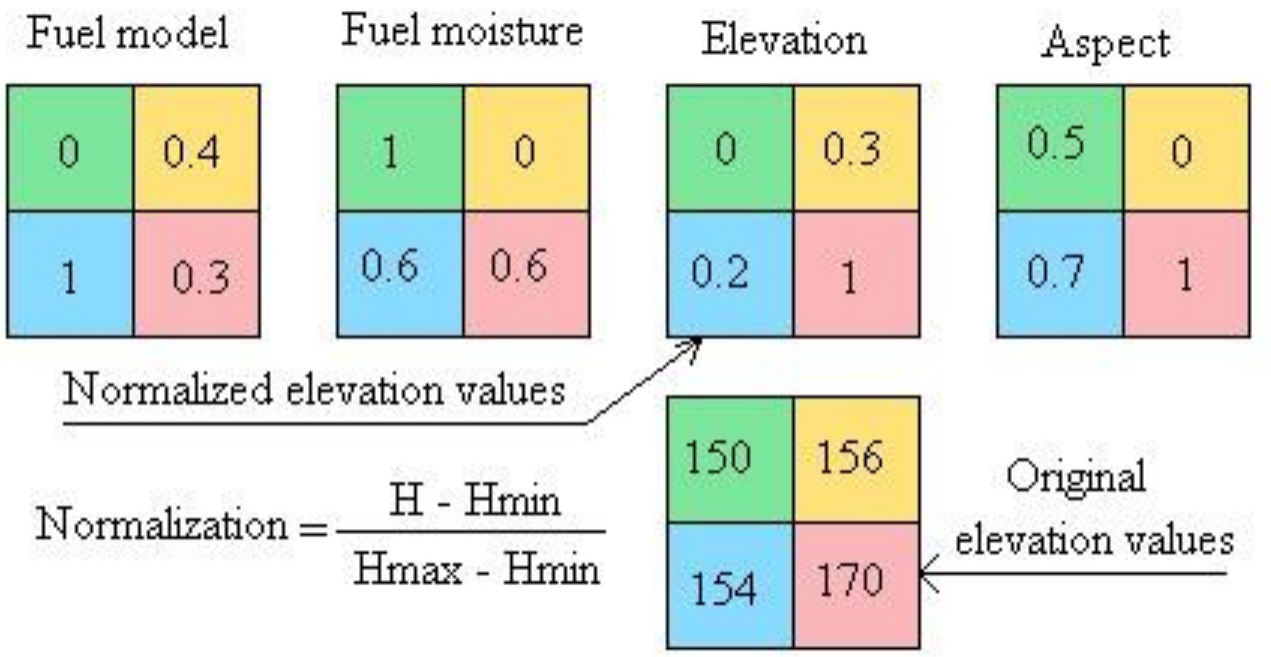

Figure 11. Several layers of same geographical area carrying data in four raster cells.

the elevation values (H) are normalized using the minimum (H_{min}) and maximum (H_{max}) elevation values. This kind of normalization has the advantage of creating dimensionless values between zero and one. This arrangement creates one scenario with four inputs for the ANN training having one corresponding value from each layer, the first set of inputs would be the green colored: {0, 1, 0, 0.5}, while the last set of inputs would be the red colored: {0.3, 0.6, 1, 1}. A total of 91 training samples (scenarios) over the same geographical area was used for historical data; 45 of them being real fires and 46 of them being no fires. There are also 25 samples (scenarios) used for evaluation purposes during training 12 of them being real fires and 13 of them being no fires. The ANN network used is a *Multi Layer Perceptron* (*MLP*) having an input layer with four neurons, a hidden layer with eight neurons and an output layer with one neuron. It has been trained through the method of error *back propagation*. The output signal would express the probability of having a fire ignited in the particular raster cell. Actually, in this project, there were a total of 17 input variables working with three different

ANN. This example, as shown in Figure 12, deals with Fire Hazard Index (FHI) using four data layers.

This ANN is initializing the learning process through random values of the weights. The computed output is then compared with the actual output of the input vector X and the weights are corrected so as to minimize the error function (*gradient descent*). The same process is repeated many times so that the error is gradually diminished until it becomes small and tolerable. To evaluate the performance of the NN, the Mean Square Error (MSE) function was used:

$$MSE = \frac{1}{n}\sum_{k}(t_k - d_k)^2 \qquad (15)$$

Where t_k is the desired outcome, d_k is the actual outcome in the output layer and n is the total number of the training samples.

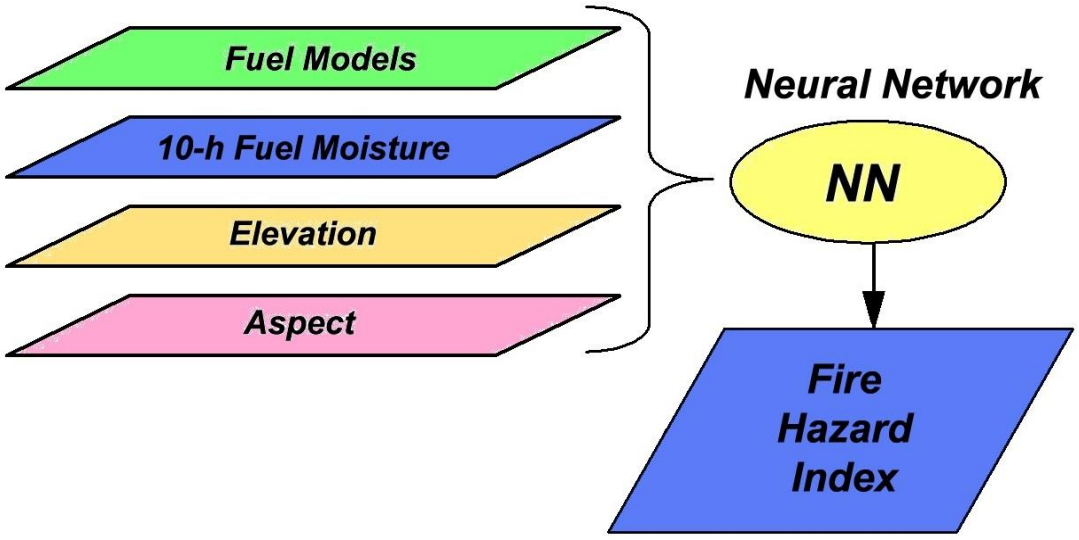

Figure 12. The fire ignition, fuel model. Source: Vasilakos et al, 2007.

The logistic function was used as an activation function, for the implementation of *non-linearity* in the network was:

$$f(z) = \frac{1}{1 - e^{-z}} \qquad (16)$$

This function approaches 1 for big positive values of z, and 0 for big negative values of z. Moreover, the use of this continuous, differentiable and monotonically non-decreasing function as the activation function allows for the interpretation of the result as a probability. The logistic function was also used in the output neurons in order to avoid the effects from noisy data that didn't conform to the identity function or any linear function.

The training procedure is performed in the following steps:

1. Initialization of weights w
2. Feeding the network with the input vector x= (x_1, x_2, . . . , x_i)
3. The input for each hidden unit is given by the equation:

$$z\_in = \sum_i x_i w_{ji} \qquad (17)$$

4. Calculation of the output of each hidden unit with z_j =f(z_in), where f is the logistic function such as:

$$z_i = \frac{1}{1 + e^{-(x_o + w_{i1}x_1 + w_{i2}x_2 + \ldots + w_{in}x_n)}} \qquad (18)$$

The input of each output unit is:

$$y\_in = \sum_i z_j w_{kj} \quad (19)$$

5. Calculation of the output of each output node with: y_k =f(y_in), where f is the logistic function in a similar way shown in Equation 20.

$$y_k = \frac{1}{1+e^{-(w_{k1}z_1 + w_{k2}z_2 + ... + w_{kn}z_n)}} \quad (20)$$

6. Weight correction using the *gradient descent* method (connecting output layer with the previous layer) as follows:

$$\Delta w_{kj}(t+1) = -r\frac{\partial E}{\partial w_{kj}} + \Delta w_{kj}(t) \quad (21)$$

Where r is the *learning rate* to control the rate and speed of the training, E is the error function.

The error function from Equation (15) can be written as follows:

$$E = \frac{1}{n}\sum_k (t_k - d_k)^2 \quad (22)$$

Where t_k is the desired outcome, d_k the actual outcome in the output layer computed from Equation 20. In this way the weights in Equation 20 are adjusted (back propagation) by taking the partial derivatives of Equation 20 with respect to individual weights as shown in Equation 21. Consequently, applying a similar technique and taking the partial derivatives of Equation 18

with respect to individual weights, the weights towards each hidden layer node are adjusted.

The process is iterative by re-feeding with new input data continuing for t iterations, (epochs), until the error is minimized.

It is important to understand that if an ANN is trained, then its internal parameters remain afterwards constant and it can be used to solve related to those trained problems. In this particular example by feeding this trained ANN with four input values (fuel model, fuel moisture, elevation and aspect) it will give in the output the probability for fire ignition due to vegetation condition and elevation slope aspect.

The functioning process of neural networks with electronic computers helps us to understand how neuron network structures work and specifically how they are programmed to hold instructions and information. Therefore, it is necessary to stress out that training is performed by a feedback repetition process, where data with known results are used to adjust its internal structure in terms of weight values until the output errors are below a threshold limit according to certain specifications. No matter how complicated a problem is, there is always an optimum network configuration in terms of hidden layers, weight values and adjustment process that provides results according to specifications. A fundamental advantage of neural networks in electronic computers is the relative high speed the network is programmed. This does not happen to biological neural networks; they behave in the same way like computer simulated neurons but at a very slow speed due to their cell based structure. Biological neuron programming process may take time of many years to get to a satisfactory level. Actually, human wisdom takes many years, maybe a lifetime, to be developed. This is very well known to

those dominating the propaganda mechanisms such as: news media, NGOs, Political parties, unions, religions, social groups, etc., and they use continuous repetition processes to do the brain programming. Sometimes they start from an infant age and they never stop.

4.2 The human brain as a neuron based structure – education issues

Human mind, if examined within human dimensions, it is the dominant mechanism in cosmos for planning and executing actions and trying to understand the universe. In this respect, in the absence of such a mechanism like the human mind, the universe could have no meaning. On the other hand, the human mind is hosted within the human brain, which is a biological neuron based structure (Hatzopoulos J. N., 2010b). Such structures can be trained or programmed to perform specific tasks. It is quite interesting related research performed at MIT Social Cognitive Neuroscience Laboratory (Saxe R, 2010). Neurons and neuron networks are well known because they can be simulated on electronic computers, as reported in the previous Section and also they can be used to solve complicated problems. A neural network was used by Christos Vasilakos et al 2009 (see Section 4.1), to estimate a fire hazard index based on 17 different variables and where the neuron network was trained using historical data for all 17 variables from past fires. There are two things to pay attention as far as neural networks are concerned; the one has to do with their error performance and the other has to do with their training or programming capability. Neuron network structures will never be absolutely correct except by accident, therefore they can be trained so that the variance of such errors is within specific threshold limits. Although biological neurons may be different than computer simulations, they also have training or programming capabilities and they also maintain the variance

of their error within certain threshold limits. As discussed earlier, most organs in the human body such as eyes, stomach, heart, kidneys, liver, etc., are controlled by local neuron structures for routine tasks and by brain neuron structures to maintain local and global equilibrium. Programming or training of neurons is related to corresponding software which in the case of biological structures or DNA technology structures we use the term *genetic software* (see Section 1.1). It must be noted that most neuron structures of the human body curry genetic software which is developed by natural processes during pregnancy. Only a small portion of genetic software is developing after birth and during the living period of a person to control most mind activities and motion. Mind itself also carries genetic software by birth, which may add some specific talents to a person. Consequently, mind in its effort to be developed builds up its own genetic software influenced by the natural and cultural environment (see Section 3.1, 3.2). A simple example to illustrate how the mind is developed and functions as a neuron based structure is given in Figure 13.

As shown in Figure 13, if someone wishes to walk over an obstacle during walking in a flat terrain, it is necessary to raise the foot. There is an "*optimum"* or the *perfect* height to raise the foot, i.e., the average of all possible correct attempts (*optimum correct*). However, raising the foot a little higher or a little lower from the optimum height, the action is considered as being *acceptably correct* because in this range there is no false step. If the height of the foot is lower than the correct height, then there is a false step and the action may be considered error with negative sign. If the height of the foot is higher than the correct height, then there is a false step and the action may be considered error with a positive sign. The magnitude of the error varies from a temporary loss of balance and return to the right position, to a serious injury. However, if human error is to be quantified, it will take values from zero to minus infinity

and from zero to plus infinity (see also Figures 4 & 5). The *midway* which is defined as *correct*, is actually the error variance of the neuron structure and it is quite similar to the *midway of virtue* as defined by Aristotle and is discussed in Section 2.2.

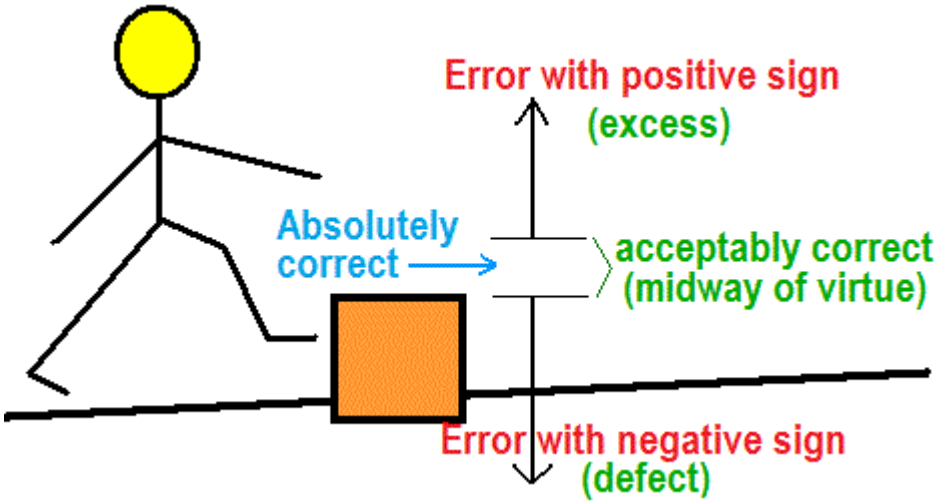

Figure 13. The functioning of a neural network and the error variance (Hatzopoulos 2009).

Therefore, one may observe the following:

(a) The boundaries of wrong and right are quite clear and can be precisely defined (see Equation 6).

(b) The function of a neuron network structure has the following characteristics:

   a. A non-trained neuron structure (for example, a little kid) the first time that will try to pass the obstacle it is likely to have a false step.

   b. The next time that will try to pass the obstacle it is going to have a better performance which means that the neuron based structure can be trained to improve its performance at any desirable level as approaching the optimum.

(c) In the same action, wrong and right (error and correct) coexist and their boundaries are located at a point where the error value is below a threshold limit (see Figure 4).

(d) Correct and error are quantities inverse proportional to each other which means that in an action with high error value the correct value is low and in an action with low error value the correct value is high (see Equation 7).

(e) Within this mid-space there are many options on the way to pass correctly the obstacle, and we may say we have infinite degrees of freedom (see Section 4.5).

(f) Freedom may be defined as the alternatives a person has to complete a correct action within well-defined error limits.

(g) Since the magnitude of the error varies from a temporary loss of balance and return to the right position, to a serious injury, then error values may be within the range from zero to minus infinity and from zero to plus infinity.

(h) Human error could be quantized as 1σ, 2σ and 3σ (Section 2.3).

(i) Bias or deception may be defined if a person knows how to pass the obstacle and on purpose is having a false step.

(j) Uneducated person may be defined as, the person who has no physical or other limitations and has a false step in passing the obstacle.

4.3 Biological structures and education

Generally speaking, DNA plays an important role in the development of biological beings and particularly in their physical development. Earlier in this book was stated that DNA in biological organisms such as mammals develops during gestation genetic software based on neural structures, which controls all the vital organs (heart, stomach, kidneys, lungs, etc.), also due to heredity, it develops an original software in the brain that has to do with the trend or the talent of the corresponding entity. For humans the development of an educated mind and its spiritual actions is partly based on the DNA that provides the initial configuration of neurons with original genetic software and

partly to the cultural environment (see Chapter 3). A decisive role, as to which of these two factors will contribute more to the education of a person, plays the power of the personality of the individual. A strong personality usually extracts from the cultural environment the best offered, enriches and blends them with own spiritual values and so shapes the character. A weak personality takes whatever is given by the cultural environment to support short seeing interests, usually vanity motivated interests, which essentially configure the character. A weak personality is affected by the propaganda, brainwash, and other *mind rape* mechanisms used for programming the human brain by creating specific bias at multiple levels. This means that a person of any origin, having a strong personality can form a superior character.

Therefore, to deal with the education of a person, it is important to have a proper cultural environment and a proper public education system to create a strong personality.

The human body is a biological structure and first of all, needs food to build up and for maintenance. Therefore, to control the quality of food someone, especially an educator, must be able to know how to do *agriculture* and how to grow/produce his/her own food. Housing, the clothes, the car and the rest of the material goods come afterwards as they provide support and maintenance of the human body. What is necessary and what is not necessary is defined by the thrift, the particular needs of the individual and his/her financial status. The value of individual goods is regulated by rules such as the rules of free market, which are based on production and demand. On the other hand, the promotion of material goods in the market is based on commercial agreements and marketing.

Nowadays, the average citizen is interested in having a better home or a better car or better clothes than a better *quality of food*, and this attitude has to do with the degree of bias or error. In other matters - such as *sunshine*, the quality of breathing *air*, the quality of drinking *water*, the natural environment etc. - the average citizen is less interested. We must remember the *Diogenes* story to stress out the value of Natural goods:

When *Alexander the Great* visited philosopher Diogenes, who at that moment enjoyed the sunshine, was standing with his followers in front of him and asked Diogenes what favor wants from him. The Diogenes answer was: "*do not take away from me what you cannot give me"*. Obviously, Alexander and his followers, were standing up and therefore taking away from Diogenes the sunshine. Alexander's answer: "*If I were not Alexander, I would like to be Diogenes"*, illustrates the constructive energy of the human mind and who out of these two men was really more powerful. On the other hand, the answer that Diogenes gave to Alexander the Great reveals the magnitude of public's ignorance of the value of sunshine.

Most biological organisms depend on sunshine. However, if the price tag of a material good shows a certain value, then the value of sunshine has no limit and it is *invaluable* and whoever understands so much the magnitude of the greatness of its value as Diogenes, he/she must be the richest person in the world. "Being invaluable" applies, as said, to air, water, food quality and natural environment and for this reason people should be more interested in maintaining the quality of these gifts of Nature at the best possible condition.

The equilibrium rule in Nature indicates that a person must try to live a simple, low profile and best quality life. It is not necessary to be like Diogenes, but could take it as an extreme example of constructive mind

energy and quality in life. Therefore, education must help people understand that it is not the excess financial status that give quality in life, but the ability to appreciate the invaluable goods provided by Nature, such as, sunshine, air, water, fertile ground and the planet Earth environment and humans must develop the ability to maintain equilibrium of all of them.

4.4 Mathematics - the best tool of mind

Mathematics, physics, chemistry and all art and science areas must be under the umbrella of philosophy. In this Section we will be dealing with mathematics to cover some important aspects which are not regularly emphasized in the organized school, but they provide philosophy with more scientific tools. The other scientific areas can be approached in a similar way, taking into consideration Sections 4.5 and 4.6.

Mathematics in education must be treated as the best tool of logic, because help the educated to expand the capacity of the mind. Unfortunately, most good mathematicians are not good teachers because they consider mathematics as an entity with extraordinary attributes, which is good for doing research in mathematics, but it is not good to teach mathematics, because they go too deep into theory and most of the educated do not like theories. Therefore, teaching mathematics it is necessary to use practical examples from daily life (Noss R., & C. Hoyles 2007). Mathematics as a tool of logic helps to analyze complicated problems, which are not directly understood by the human mind, into simple ones which are well understood. Therefore, mathematics, as defined by James Franklin 1995, is the *science of structures* and deals with the interrelation of structural elements of simple and/or complex structures. Mathematics helps us because it describes the existing relations among the structural elements of a structure analytically with

mathematical expressions. Consequently, if we know the values easily obtained for certain structural elements of a structure, then we can calculate or estimate the values of the rest of the structural elements, which otherwise it is difficult to determine.

Let's take on a level and clear ground a piece of thread, and pin one of its ends down using a nail. Then we can draw a *circle* on the ground with the other end of the thread using a sharp object (see Figure 14). The nail is the *center* of the circle, and the length of the piece of thread is its *radius*. This circle is a geometric structure with basic structural elements or parameters, such as the radius, the *diameter*, the *perimeter* and the *area*.

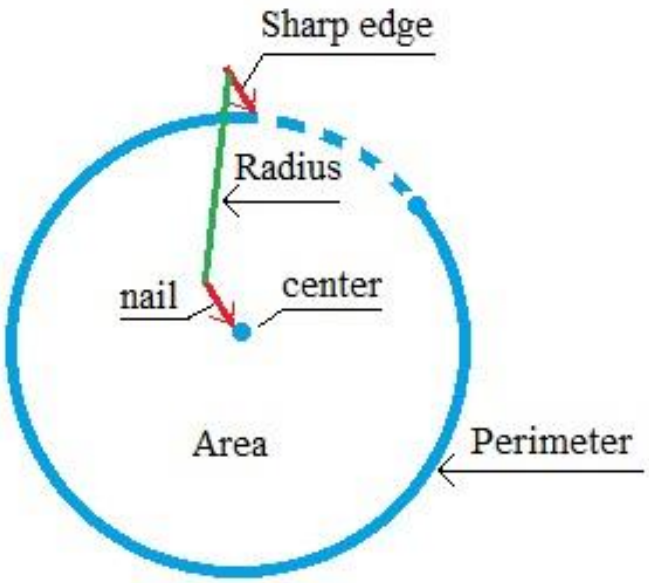

Figure 14. Circle construction and some of its structural elements.

There are also some other elements such as the *arc*, the *chord*, the *central angle*, *trigonometric parameters,* etc., in which we are not currently interested. If we want to learn the size of a structural element of a circle, such as the perimeter, or the area, then it is relatively difficult to measure it directly on the ground. On the contrary, it is very easy to measure the radius or the diameter. Eventually, provided that we consider the radius known, then we

can calculate the perimeter and the area. The perimeter is calculated by the expression:

$$\text{Perimeter} = 2 \times 3.14 \times \text{Radius}, \qquad (23)$$

or using the expression:

$$c = 2\pi R \qquad (24)$$

The area is calculated by the expression:

$$\text{Area} = 3.14 \times \text{Radius} \times \text{Radius}, \qquad (25)$$

or using the expression:

$$A = \pi R^2 \qquad (26)$$

Expressions 24 & 26, are simple equations with two parameters (radius, perimeter) and (radius, area) a known constant of 3.14 is known as π, which is the quotient of the division of the length of the perimeter of any circle by the length of corresponding diameter. The quantity π has an infinite number of decimal digits and can be defined at any desirable precision. Such expressions are also named *functions*. Consequently, we may say that the perimeter of a circle is a function of its radius and it is expressed with the following equation or expression:

$$c = f(R) \qquad (27)$$

In such an expression, on the left of the equal sign, we usually have a parameter or variable which is called *dependent variable* and, on the right of the equal sign, we usually have the function or expression with one or more variables named *independent variables*. The independent variables are usually multiples of known factors or *constants*, which can be real or imaginary numbers. For example, in the relation $c = 2\pi R$, the factor of R is 2π, which is a known constant, and is equal to 6.28. If we give values of the independent variables, we can calculate the value of the dependent variable. The case of the circle is a simple one because it has only one independent variable in the function (structural relation), that is, radius. If one gives a value to the radius -and such a value is usually obtained from measurements - one can calculate the value of the dependent parameter using the mathematical expression. In our example, we can thus easily measure the radius (the length of the thread) and we can then calculate the other parameter (perimeter or area) by using the corresponding mathematical relation.

A function with many parameters can be symbolized as follows:

$$Y = f(u, v, w, \omega, \varphi, \xi) \qquad (28)$$

Functions can also be linear, polynomial, hyperbolic, logarithmic, trigonometric, imaginary, binary or Boolean, etc., depending on whether the parameters of these functions have such type of mathematical expression.

The circle is a relatively simple geometric structure and, therefore, the relations that are given are simple. What happens, though, when having complicated structures? The answer is that complicated structures are approached in several ways, when mathematics is used. If we take, for example, the earth's surface which is a very complicated structure and try to

describe it in mathematics, then it will be a mathematical expression which will accept values of geographic coordinates[3] of any point on the earth's surface (independent variables), and the precise elevation (the dependent variable) at that point must be calculated, that is to say:

$$\text{Elevation} = \text{Function of}(\lambda, \varphi) \quad \text{or} \quad Z = f(\lambda, \varphi) \qquad (29)$$

To do this, two methods are available.

The first method is an enormous equation with an enormous number of factors. One such factor will be composed of one coefficient multiplied by an expression of φ (*latitude*) and λ (*longitude*). The coefficients can be determined analytically when points on the ground are measured. If more precision is desired, then, more coefficients must be determined and, therefore, more measurements will be performed. Each measurement on the ground measures both the geographic coordinates' φ, λ and the elevation Z and creates a new mathematical equation. In this way, a system of equations is created, and each equation has the same unknowns which are the structural elements (*coefficients*) of the structure. The number of measurements should be larger than the number of coefficients in order to have a statistical analysis and a control of precision. Complicated structures, however, can be described with complicated mathematical relations and the structural elements are determined by a large number of measurements which lead to the creation and solution of a system of a large number of equations with a large number of unknowns. Each measurement is used to create a new equation and is usually better to have more measurements to increase the degrees of freedom and therefore, to better control the precision.

[3] Geographic coordinates are known as latitude and longitude (φ, λ) defining the position of any point on the surface of the earth. Those parameters can be measured by Global Positioning System (GPS) and thus are considered to be known.

The second method, called *digital elevation model* (*DEM*), divides the ground surface in small square cells ordered in rows and columns. The surface of such cells is considered either plane or curved, and, therefore, the surface of each cell can be described by a simple mathematical function. The coefficients of such a function are defined from the measurements. The smaller the size of the cell is, the better precision is obtained and the more measurements are required.

Mathematics is used for any type of structures without any exception (i.e. geometric, physical, chemical, social, legal, political, philosophical, theological etc.). Mathematics is also independent of the degree of complexity of the structure, something that can help considerably in the solution of excessively complicated problems. As an example, *meteorology* being a very complicated problem is based on mathematical equations which model the behavior of Earth's atmosphere. In such equations many of the independent variable parameters such as temperature, humidity, wind, etc., are measured directly through a network of meteorological stations. Other parameters are measured from satellite images and instruments on balloons, aircrafts and satellites. The result of such models is to make predictions and in this example, weather prediction. *Earth sciences*, another example, try to create models to simulate phenomena such as climate change and planet overheating. Such models help to make predictions using equations as described above and they need reliable measurements on globally located points for many parameters, in order to provide reliable results. For this reason there is a great number of Earth orbiting satellites called EOS (*Earth Observation Satellites*) which provide such data. Regarding Earth science models, we have to understand that they need a lot of work for further improvement, especially in case of nonreversible processes which could be

either excessive heating of the planet or total freeze of the planet. Meanwhile, educated people must request directives / measures at international level to stop destroying the atmosphere.

Therefore, mathematics helps us in the analysis of structures into particular elements or parameters and in the creation of expressions or relations that give a precise interrelation among these parameters. In this way, we can use mathematics to create a system which gives us solutions or predictions to specific problems. Generally, a system can be considered as follows:

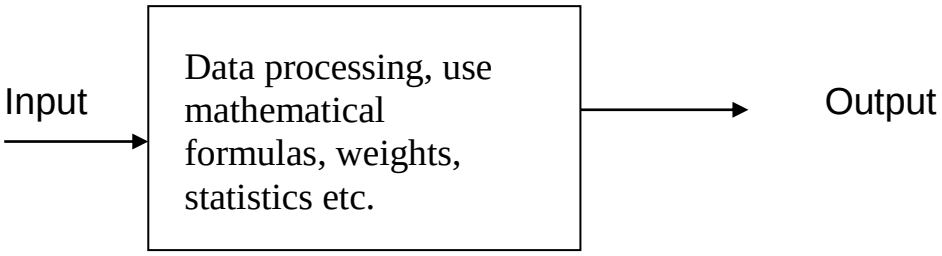

Figure 15. A typical system with data processing based on mathematics.

In order to better clarify the use of mathematics, let's take a structure in which one would not think of using mathematics. Let's suppose that such structure is a tomato salad. The structural elements of this structure for three portions could be: 1 kilo of tomatoes, 50 grams of olive oil, 10 grams of salt, 10 grams of vinegar, and 5 grams of oregano. If we want to express the tomato salad with a mathematical function, then we have:

Tomato salad = Function of (tomatoes, olive oil, salt, vinegar, oregano) (30)

The quantities used may be added to a dish and form the salad, but cannot be added mathematically because they are of a different kind. Therefore, we

will use another type of mathematical expression called matrices. Therefore, the precise mathematical expression of tomato salad can be given as follows:

$$TomatoSalad_3 = \begin{bmatrix} 1.0\,Kg\,Tomatoes \\ 0.050\,Kg\,OliveOil \\ 0.010\,Kg\,Salt \\ 0.010\,Kg\,Vinegar \\ 0.005\,Kg\,Oregano \end{bmatrix}$$

$$or \quad T_3 = \begin{bmatrix} 1.000 \\ 0.050 \\ 0.010 \\ 0.010 \\ 0.005 \end{bmatrix}, \begin{bmatrix} Kg\,Tomatoes \\ Kg\,OliveOil \\ Kg\,Salt \\ Kg\,Vinegar \\ Kg\,Oregano \end{bmatrix} \qquad (31)$$

where T_3 means three portions of tomato salad. Consequently, mathematics can provide the ingredients of tomato salad for any number of portions in an easy way. If one needs, for example, ingredients to make 19 portions of tomato salad, then this new tomato salad can be mathematically expressed as:

$$T_{19} = \frac{19}{3} T_3 = \frac{19}{3} \begin{bmatrix} 1.000 \\ 0.050 \\ 0.010 \\ 0.010 \\ 0.005 \end{bmatrix} = \begin{bmatrix} 6.333 \\ 0.317 \\ 0.063 \\ 0.063 \\ 0.032 \end{bmatrix}, \begin{bmatrix} Kg\,Tomatoes \\ Kg\,OliveOil \\ Kg\,Salt \\ Kg\,Vinegar \\ Kg\,Oregano \end{bmatrix} \qquad (32)$$

Among other things, Mathematics, are involved in:

(a) *Transformations*. Mathematics may take, for example, a non symmetric structure, like a digital image, and transform it into symmetric as it is the power spectrum of the image; this is a so-called *Fourier transformation*.

(b) *Numerical methods*, which can solve linear or nonlinear systems of any number of equations and of any number of unknowns. Even for systems that their solution is theoretically impossible, mathematics offers solutions using criteria and methods such as the *pseudoinverse* in *singular systems*.

(c) *Probability* theory, which develops mathematical relations between parameters that take random values or are reported in random events, thus creating *stochastic models*.

(d) *Statistics*, which is based on the probability theory, allow computation of parameters of stochastic models with a limited number of data or *samples*.

(e) Mathematics, which can exceed the limits of the three dimensions of a geometrical space in which human sense is limited, and can be expanded into spaces of any number of dimensions.

(f) *Chaos theory*, which can deal with chaotic structures and can make estimates of parameters that have a chaotic behavior based on historic events and set of rules. Human history is chaotic, and it is important to know historic events with minimal bias in order to estimate the evolution of human actions.

(g) *Neural networks*, which deal with neural structures and, based on training data and results, can solve problems in a similar way that human brain works.

(h) Phenomena such as gravity, electricity, magnetism, etc., as well as the fields these phenomena create, as described by mathematics with simple relations such as the *differential equations*. Such equations describe the behavior, for example, of material particles, such as is the movement of water in an open channel with the effect of gravity.

4.5 Statistics – specification variance

Statistics may help a person, especially the educator, to better understand the rule of equilibrium in Nature, the meaning of specifications and the midway of virtue. As stated in Section 2.3, the difference between probability theory and statistics is that probability is dealing with a total *population* of random events such as human errors, while statistics deal with a finite subset of the population called *sample*. Random events are happenings which cannot be predicted exactly. In this respect most happenings have a random component. For example, measuring a long distance with a tape we may measure it several times and take the average of the measurements, but no matter how many times we measure the same distance unless we perform the measurement we do not know exactly what the outcome will be. Therefore, we may say that the measurement of a distance d_i has a random component v_i and because of this, we consider d_i, and v_i as being random variables. Actually the true value of the distance D_i is related to the measured distance and its random component by the relation:

$$D_i = d_i - v_i \qquad (33)$$

There is no limit on how many times we can measure a distance and therefore, the *population* of all measurements of same distance is infinity. Therefore, *probability theory*, in case of a distance measurement, deals with a

population of *random events* having infinite values. Consequently, statistics could be used to estimate the population parameters using a subset of the population or sample. In case of one random variable like a distance, the sample must be composed of two or more measurements. The more the sample size is, the more the degrees of freedom are, making the estimation more accurate and more stable. Degrees of freedom provide the number of alternatives involved in a sample. Measuring a distance one time there is no alternative and therefore, zero degrees of freedom, measuring it five times there are four alternatives and therefore, four degrees of freedom. Such events, as for measuring a distance, and according to probability theory, the distribution of error values has a Gaussian or normal form as expressed by Equation 9 and shown in Figure 5.

Statistics work with a subset of the population called *sample* and based on the sample values, the population parameters such as the *mean* and the *variance* are *estimated*. Estimation helps to obtain the best values (*best estimates*) of a parameter using the sample values, at the same time estimation controls the precision. The *average*, for example, of measurements of a distance is more precise than a single measurement. At the same time the precision is expressed by another parameter called *variance*, or, another parameter computed from the variance called *standard deviation*. Estimation does not give exact values for parameters, but provides values within certain probability levels. For example, a series of measurements of a distance gives a mean value of 61.634 m and a standard deviation $\sigma = \pm 0.025$ m this means that at least 68% of the measurements must be within the range from the mean value by ±0.025 m (61.609 - 61.669). Taking $2\sigma = \pm 0.050$ m, then at least 95% of the measurements must be within the range from the mean value ±0.050 m (61. 584 – 61.684). Taking $3\sigma = \pm 0.075$ m, then at least 99.7% of the measurements must be within the

range from the mean value ±0.075 m (61.559 - 61.709). Specifications follow the estimation procedures. If, for example, a topographic map is to be made, then specifications may state that at the 95% probability level, the horizontal precision must be $2\sigma_{xy} = \pm 0.08$ m. To check if specifications are met when the map is ready, then a sample of measurements of distances is taken on the map (d_i) and matching ones (R_i, i = 1,2,3,…, n) on the ground. These distances are measured on the map with a ruler and they are divided by the map scale to be equivalent to ground distances. These distances are measured on the ground by a very precise instrument, i.e., ±5mm. Then the standard deviation or the root mean square error (RMSE) is computed as:

$$\text{RMSE} = \sigma_{xy} = \pm\sqrt{\frac{1}{n-1}\left[(d_1 - R_1)^2 + (d_2 - R_2)^2 ... + (d_n - R_n)^2\right]} \quad (34)$$

Then $2\sigma_{xy}$ must be less than or equal to 0.08 m to be within the specification limits.

The quantity (n - 1) expresses the degrees of freedom, with other words, the number of measurements in a sample minus the number of random variables defines the *degrees of freedom*. As stated earlier, one measurement of a distance has zero degrees of freedom because there are no other alternatives for the length of the distance. Two measurements of the same distance provide one alternative and therefore one degree of freedom. *Human freedom* can be defined the same way as of the alternatives someone has for a certain action. A prisoner has one alternative being the prison cell and therefore, zero degrees of freedom. A free citizen can visit many places having many degrees of freedom.

In a series of measurements of a distance d_i (i=1,2,3,…,n), the *average* or *mean* value $\bar{d}$ is computed as:

$$\bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i = \frac{d_1 + d_2 + ... + d_n}{n} \tag{35}$$

The *error value* v_i is computed as:

$$v_i = \bar{d} - d_i \tag{36}$$

The *variance* is given by the formula:

$$\sigma_d^2 = \frac{1}{n-1}\sum_{i=1}^{n}(d_i - \bar{d})^2 = \frac{1}{n-1}\left[(d_1 - \bar{d})^2 + (d_2 - \bar{d})^2 ... + (d_n - \bar{d})^2\right] \tag{37}$$

Where n - 1 are the degrees of freedom (there is only one random variable d_i).

The *standard deviation* is given by the formula:

$$\sigma_d = \pm\sqrt{\sigma_d^2} = \pm\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(d_i - \bar{d})^2}$$

$$= \pm\sqrt{\frac{1}{n-1}\left[(d_1 - \bar{d})^2 + (d_2 - \bar{d})^2 ... + (d_n - \bar{d})^2\right]} \tag{38}$$

Formula (38) gives the standard deviation of one sample value; consequently, the mean value has a better precision depending on the number of measurements expressed as follows:

$$\sigma_{\hat{d}} = \frac{\sigma_d}{\sqrt{n}} \qquad (39)$$

These are the *basic formulas in statistics*; therefore, many times we perform measurements of more than one random variable on a particular subject, which are not independent but correlated. A color image scanner, for example, performs three measurements to estimate corresponding R (red), G (green), B (blue) values of *primary colors* on a *picture element* (*pixel*). These R, G, B values determine the color hue of the pixel. Therefore, these values are highly correlated, with other words; the value of the R is influenced by the values of G and B. To understand it better, if in a dark area a tiny green light turns on, consequently, a larger area is illuminated providing different hues and therefore a specific illumination of a pixel affects the illumination of many others. The correlation of two random variables is expressed by their *covariance* and the correlation of many random variables is expressed by their *covariance matrix*. By knowing also the covariance and standard deviation, then the *correlation coefficient* between two random variables is computed. Correlation coefficient close to ±1, indicates high correlation, while close to zero indicates low correlation. Positive covariance and therefore a positive correlation between two random variables mean that when the one is increasing, then the other one is increasing too. Negative covariance and therefore the negative correlation between two random variables mean that when the one is increasing, then the other one is decreasing. Most statistical parameters in correlated random variables are computed as follows:

Let us consider the series of observations of three correlated quantities X, Y, Z:

$$\begin{array}{l} x_1, x_2, x_3, \ldots x_n \\ y_1, y_2, y_3, \ldots y_n \\ z_1, z_2, z_3, \ldots z_n \end{array} \qquad (40)$$

Then the corresponding means $\bar{x}, \bar{y}, \bar{z}$ or most probable values of these observations are given by the relations:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i = \frac{x_1 + x_2 + \ldots + x_n}{n}$$

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i = \frac{y_1 + y_2 + \ldots + y_n}{n}, \qquad (41)$$

$$\bar{z} = \frac{1}{n}\sum_{i=1}^{n} z_i = \frac{z_1 + z_2 + \ldots + z_n}{n}$$

Variances σ_i^2 and covariances σ_{ij} are given by the relations:

$$\sigma_x^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2 = \frac{1}{n-1}\left[(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 \ldots + (x_n - \bar{x})^2\right]$$

$$\sigma_y^2 = \frac{1}{n-1}\sum_{i=1}^{n}(y_i - \bar{y})^2 = \frac{1}{n-1}\left[(y_1 - \bar{y})^2 + (y_2 - \bar{y})^2 \ldots + (y_n - \bar{y})^2\right] \qquad (42)$$

$$\sigma_z^2 = \frac{1}{n-1}\sum_{i=1}^{n}(z_i - \bar{z})^2 = \frac{1}{n-1}\left[(z_1 - \bar{z})^2 + (z_2 - \bar{z})^2 \ldots + (z_n - \bar{z})^2\right]$$

$$\sigma_{xy} = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y}) = \frac{1}{n-1}\begin{bmatrix}(x_1 - \bar{x})(y_1 - \bar{y}) + (x_2 - \bar{x})(y_2 - \bar{y}) + \ldots \\ +(x_n - \bar{x})(y_n - \bar{y}\end{bmatrix}$$

σ_{xz} and σ_{yz} are also derived in a similar way

The correlation coefficients ρ_{ij} are given by the relations:

$$\rho_{xy} = \frac{\sigma_{xy}}{\sigma_x \sigma_y} \qquad \rho_{xz} = \frac{\sigma_{xz}}{\sigma_x \sigma_z} \qquad \rho_{yz} = \frac{\sigma_{yz}}{\sigma_y \sigma_z} \tag{43}$$

More analytically, the quantities involved are defined as follows:

Means, or *most probable values*: $\bar{x}, \bar{y}, \bar{z}$

variances: σ^2_x, σ^2_y , σ^2_z

standard errors, or *standard deviations*: σ_x, σ_y, σ_z

covariances: σ_{xy} , σ_{xz}, σ_{yz}, Notice that covariance symbol is not squared as taking positive and negative values.

correlation coefficients: ρ_{xy}, ρ_{xz}, ρ_{yz}

In addition to these formulas there are also statistical tests with hypothesis testing methods to test the consistency and significance of the parameters. Statistical hypothesis testing is used to investigate crimes taking into consideration existing evidence to compute probabilities for various scenarios. Such methods must be also used by historians to investigate crimes through human history, which have not been investigated yet and may help us to locate continuous crimes against humanity through the centuries by a specific cast of criminals.

The following example is more illustrative on most statistical parameters. Given is a scanned painting of a portrait as shown in Figure 16. The 25th

column from the left of the portrait on the left image has 24 pixels, and each pixel has three values of 8-bit length each representing accordingly, the values of the three primary colors R (red), G (green), B (blue). This means that each value is between zero and 255, a total of 2^8 = 256 different values coded in 8-bit code. The 24 values of each primary color R, G, B, of the 25th column from the left in the left picture are:

R	G	B
205	166	169
226	132	128
206	148	142
171	177	171
164	184	178
167	186	181
163	184	179
177	183	187
140	134	143
144	141	148
140	139	142
104	100	106
168	157	159
162	156	162
170	181	178
149	155	157
206	197	198
241	214	188
241	212	181
241	225	210
188	178	188
226	219	226
231	225	234
157	148	162

Figure 16. A scanned portrait of my daughter's awarded painting with 24 rows by 30 columns on the left and with 259 rows by 323 columns on the right.

We are going to use the above formulas and compute for each primary color B, G, R the following statistical parameters: Mean value, variance, standard deviation, covariance matrix and correlation matrix given as follows:

This job has 3 Sets and 24 Measurements

The input data is:

205. 166. 169.

226. 132. 128.

206. 148. 142. ...

The average values are:

R	G	B
182.792	172.542	171.542

The variances are:

σ_R^2	σ_G^2	σ_B^2
1434.0851	1077.9112	869.9112

The Standard deviations are:

σ_R	σ_G	σ_B
37.869	32.832	29.494

The Covariance matrix is:

1434.085145	929.422101	708.161232
929.422101	1077.911232	915.389493
708.161232	915.389493	869.911232

The correlation matrix is:

1.	.747539	.634026
.747539	1.	.945316
.634026	.945316	1.

As said earlier, the correlation is very high if it is close to ±1 and very low if it is close to zero. In this example, the correlation is very high 0.945, between green and blue, lower 0.748, between red and green and much lower 0.634, between red and blue. The red average 182.792 is larger than the green and the blue and also has less correlation with green and blue and therefore is the dominant hue in this column of the image. In this particular example, variances indicate the amount of information carried out by each primary color. Red color has 1434.0851 the largest variance, thus carrying the most amount of information.

Every person and mostly the educators should know these basic things about statistics, it will help not only to understand the specifications in natural and artificial (man-made) objects, but they will also understand about the meaning of scientific estimation.

4.6 Computer programming – humans as creators

Electronic computer is the best tool for information management. Actually, humans in their effort to manufacture a machine to look alike themselves, they invented and manufactured the electronic computer. This machine indeed is composed of two parts the one being *mortal* called *hardware (HW)* and the other being *immortal* called *software (SW)*. The software itself is a product generated by *human mind* whose spiritual work is also immortal.

According to Plato *Timaeus* 28a, there is a crucial question about mortality / Immortality:

τί τὸ ὂν ἀεί, γένεσιν δὲ οὐκ ἔχον, καὶ τί τὸ γιγνόμενον μὲν [28α] ἀεί, ὂν δὲ οὐδέποτε; τὸ μὲν δὴ νοήσει μετὰ λόγου περιληπτόν, ἀεὶ κατὰ ταὐτὰ ὄν, τὸ δ' αὖ δόξῃ μετ' αἰσθήσεως ἀλόγου δοξαστόν, γιγνόμενον καὶ ἀπολλύμενον, ὄντως δὲ οὐδέποτε ὄν.
(what would be the entity who always exists and never has been born? And what would be the one who always is born, but never exists? The one is understood by thinking using a mind process because it remains unchanged, the second one is understood by the senses a non-mind process because it has birth and death, while in reality never exists).

In this sense, immortality has to do with something that always exist, but never is born, which may be the scientific truth approached with a mind process and any scientific discoveries can be viewed in the form of documents, software and other forms whose content is independent of time and therefore, being immortal. The second one is the human body, the hardware, which has birth and death, undergoing a vanishing process. The only remains of the body is not a reality, it is only a *virtual reality*. Examining carefully the term *never exists,* we may consider that the *past* within human dimensions is actually a virtual reality; the *future* accordingly is also a virtual reality and therefore, what remains is the present, which is a *momentum* taking place at a time with zero duration. On the other hand, same conclusion comes out of the answer to the question: *what would be after death*? Could be: *whatever was before birth*, (Hatzopoulos J. N., 2004). These explain Timaeus expression *… it has birth and death, while in reality never exists*.

Furthermore, the immortality of human mind or spiritual achievements, is expressed by its generated information, which is recorded on material media such as books, magnetic media, pictures, sounds, computer memory and peripherals, silicon chips, and so on. Electronic computers were developed

on the second half of last century and since the 1980's they evolved rapidly into an exclusive tool for handling all kinds of information. Today electronic computers handle information of every action of human mind in all kind of business (government, banking, personal data, social economic and political data, etc.). Electronic computers continue their rapid evolution up today being used in most human activities.

Information sciences have been adopted by the scientific community to carry out most scientific processes being the lever for extraordinary progress in all fields of science. This progress in information sciences and in all other scientific fields, is attributed to the evolution of software, which represents the ultimate product of high technology and it is the most appropriate media to carry out the immortality of human mind discoveries.

One educational issue to be discussed as far as software is concerned, is whether to be used as a black box by educators and students, or, to understand it from the inside by developing the ability to produce software as early in the education system as possible. This has not been resolved yet with negative results to both educators and students, such as maintaining an inferiority level of intelligence as compared to such ability of the machine and they are actually developing their personality as *button pushers*.

It is our duty as educators to support as much as possible the efforts for software development by the students so that they would be *smarter than the machine* and they will use the machine efficiently for their scientific and professional progress. To achieve this goal, it is necessary to develop educational material which explains in an easy way the computer basic structure and functioning and the logic steps used to create software handling simple and complicated problems.

It will be an effort, as stated earlier, to explain in a simple way what a computer is and how it is functioning. It is amazing the simplicity a computer works by actually being capable to do only signal additions in a binary system and by moving fast binary signals. The only noticeable capability of the computer is that such operations are performed at high speeds almost approaching the speed of light.

One example to understand the functioning of the computer is the *lock* which is *unlocked* by a certain *combination of numbers* or *code*. Any other combination except the proper one cannot open the lock. Electronic computers work in a similar way and the *hardware* is the lock, while the *software* is the combination of numbers.

In the heart of an electronic computer there is a *clock* generating regularly *vibrating pulses* or *signals* based on a quartz crystal thus creating a uniform code of 1, 0, 1, 0, 1, 0, … These pulses are amplified to maintain a constant amplitude and a constant frequency as shown in Figure 17.

The *clock frequency* in a computer could be around three billion signals per second (~3 GHz) and this has a direct impact on the computer speed. The clock pulse could be considered a uniform code carrying only two pieces of information (1, 0, or, on, off, or, tick, tack, etc.) having no significant meaning for the computer. This uniform pulse flows in all electronic circuits of the computer hardware and can be *modulated* into a *specific code* either by pressing a key button on the keyboard, or, by running a program, or by moving data. For example, pressing the letter R on the keyboard, the uniform code 01010101 is modulated to a code 01010010, which as a decimal number is 82, as a hexadecimal number is 52, and as an octal number is 122.

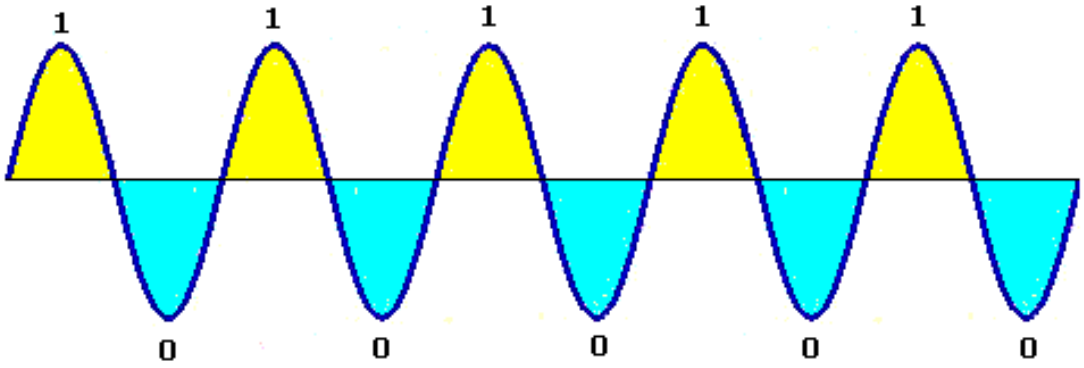

Figure 17. A pulse generated by the clock having a uniform code of: 1 0 1 0 1 0 1 0 ...

Codes flowing within the computer circuits are composed of any combination of 1 and 0, which are the digits of the *binary numbering system* and they are called *bits*. Therefore, bits are originally generated at a regular pattern by the computer clock and consequently are modulated into a variety of codes. Usually these pulses are identified by the circuits as high voltage for the ones and low voltage for the zeros. It is also important to state that a code is composed of a specific number of bits which are multiples of 8-bit code and powers of 2, such as 16-bits (2^4), 32-bits (2^5), 64-bits (2^6), etc. The 8-bit code is called *byte* and can generate 2^8 = 256 different codes (http://www.asciitable.com/).

The way codes are generated with binary digits can be illustrated with the following example: Consider a 3-bit code, which can generate 2^3 = 8 different codes as follows:

Three bit binary codes: **000 001 010 011 100 101 110 111**

Corresponding *octal* numbers: **0 1 2 3 4 5 6 7**

Figure 18. Three-bit codes which correspond to the digits of the *octal* numbering system.

Accordingly, in Figure 19, are shown all four-bit codes, which are the digits of the *hexadecimal* system having a total of 2^4 different codes or different hexadecimal digits.

Binary:	**0000**	**0001**	**0010**	**0011**	**0100**	**0101**	**0110**	**0111**
Hexadecimal:	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Binary:	**1000**	**1001**	**1010**	**1011**	**1100**	**1101**	**1110**	**1111**
Hexadecimal:	**8**	**9**	**A**	**B**	**C**	**D**	**E**	**F**

Figure 19. Four-bit codes which correspond to the digits of the hexadecimal numbering system.

Octal and hexadecimal systems have a special meaning in computer sciences because they are transformed directly into the binary system as follows: Consider the binary number 1001110101110010011101, to make it octal we separate its digits in groups of three starting from the end: 001 001 110 101 110 010 011 101, and then we substitute each individual group with the corresponding octal number from Figure 18 to obtain: 11656235 so that:

$1001110101110010011101_2 = 11656235_8$

The same binary number is also easily transformed into a hexadecimal number by separating its digits in groups of four starting from the end: 0010 0111 0101 1100 1001 1101 and then we substitute each individual group with the corresponding hexadecimal number from Figure 19 to obtain: 275C9D so that:

$1001110101110010011101_2 = 275C9D_{16}$

Notice that each hexadecimal digit is half a byte. For example, the R letter with hexadecimal code 52 is in binary form 5 → 0101, 2 →0010 → 01010010.

Therefore, the code carried by a byte can be represented by two digits of the hexadecimal system and usually computer systems use hexadecimal digits instead of binary codes.

The binary codes as they are flowing within the electronic circuits of the computer, they function like the combination of numbers in the lock, mentioned above, used to unlock the lock and they actually unlock certain actions to be taken by matching their code. As an example, consider pressing the button <PrtSc> in the keyboard, this action matches the code to unlock the print screen process. In other words, by pressing the <PrtSc> button, the clock code is modulated to a code which matches the code that unlocks the print screen process and this process transfers to the *clipboard* all *graphics* shown on the screen.

As mentioned earlier the computer is capable of doing at high speeds two things additions and moving information in a binary form. The addition has to do with the comparison of two signals carrying a binary code and creating a new binary code which is the result of the addition. During the addition, a comparison of corresponding bits takes place and if corresponding bits are similar, then a new bit of zero is created and if similar bits are 1, then in addition, a 1 bit shift is performed to the left, if corresponding bits are not similar, then a new digit of one is created as follows: Let us add 001 + 101, then in the octal system this counts $1 + 5 = 6_8$, in the decimal system is 6_{10}, doing the binary addition it is obtained:

001
101 → 100 (similar bits result to zeros and dissimilar to one)
1 → 010 (one bit shift is performed to the left because bits are ones)
110 → final result 6_8.

One more example: 110 + 100 = 6 + 4 = 12_8 = 10_{10}

110
100 → 010
1 1000 → 1010

Subtraction is transformed into addition, by taking the complement of the quantity to be subtracted. Example, let us do the decimal subtraction of: 312 – 179, the complement of the 179 is 820, which is the difference each digit has from 9, which is the last digit of the decimal system, then the action becomes an addition as follows:

312
820 → 132
+1 → 133

To obtain the complement in the binary system, it is a simple operation, transforming the 1 to 0 and the 0 to 1 as follows: 100011101 its complement is: 011100010

Multiplication is a multiple addition operation and division is a multiple subtraction operation and thus all these operations are reduced to signal comparison (0, 0) → 0, (0, 1) → 1, (1, 0) → 1, (1, 1) → 0 plus 1 shift to the left. In a similar way logical operations are also performed with bit comparison. Both arithmetic and logical operations are performed electronically using elementary circuits for signal processing called *gates*, which are part of the scientific area of *digital logic*.

To better understand software development, we are going to develop a computer program (software) in Visual Basic (VB-6) to perform basic statistics as they were formulated by Equations 39, 40 & 41. The program takes data values from an input file with up to m-sets of measurements (m-random variables) with m = 1, 2, …, up to 8. Each set could have any number of (n-values) > 1, but n must be the same for all sets. The program computes the *average*, *variance* and *standard deviation* of each set and the *covariance* of any two sets. Consequently, it computes the covariance and *correlation matrix* for all sets. The input data will be in an ASCII text file and the output will also be in an ASCII text file. The program will be interactive with a user interface form. The Form will contain command buttons to enter and display the path and names for input and output files, Start and End buttons. On the Form will be displayed: (a) number of sets, number of measurements in each set, (b) list of averages, variances, standard deviations and covariance and correlation matrices. The data file used to process the data in Section 4.3 has 3 sets with 24 measurements per set and its input file is:

3,24
205,166,169
226,132,128
206,148,142
171,177,171
...
157,148,162

Where m=3 and n=24

The steps taken to develop this program are as follows:

1. Design of graphical user interface – Form design in Visual Basic - 6 as shown in Figure 20. The interactive objects in the Form are divided into two groups the one performing input and processing operations and the other displaying the results with maximum 8 data sets as a full display. If data sets are less than 8, then corresponding excess objects are not displayed as shown in Figure 20. Each group of objects is located in a different frame so that each group is independent from the other. Processing takes place through a single operation called “Start” which opens the input and output files, enters the input data, performs all computations and prints the results in both output file and the interactive Form.
2. Processing algorithm. This is a simple algorithm based on Equations 41, in Section 4.3 to compute the means, then using the formulas (42) to compute the variances/covariances and formulas (43) to compute the correlation coefficients. The algorithm has the following basic steps:
   (a) Input number of sets and number of measurements to define the capacity of the program (redimension of the data arrays and create the size of data parameters).
   (b) Make the visible attribute “False” for objects in the display part of the Form which do not hold values in a specific run of data.
   (c) Input number of sets *Ns* and number of measurements *Nm*.
   (d) If *Ns > 0* and *Nm>1*, then proceed otherwise stop.
   (e) Input all set of measurements, print in the output file and compute and print averages for each set.
   (f) Compute differences from corresponding average and compute and print variances and standard deviations.
   (g) Compute and print covariance matrix.
   (h) Compute and print correlation matrix.

(i) The module is composed of a single subroutine which is based on the above described algorithm steps and does all input output and processing operations. This module to be reusable needs to take out all Form dependent statements and have only two arguments to communicate the input and the output file name.

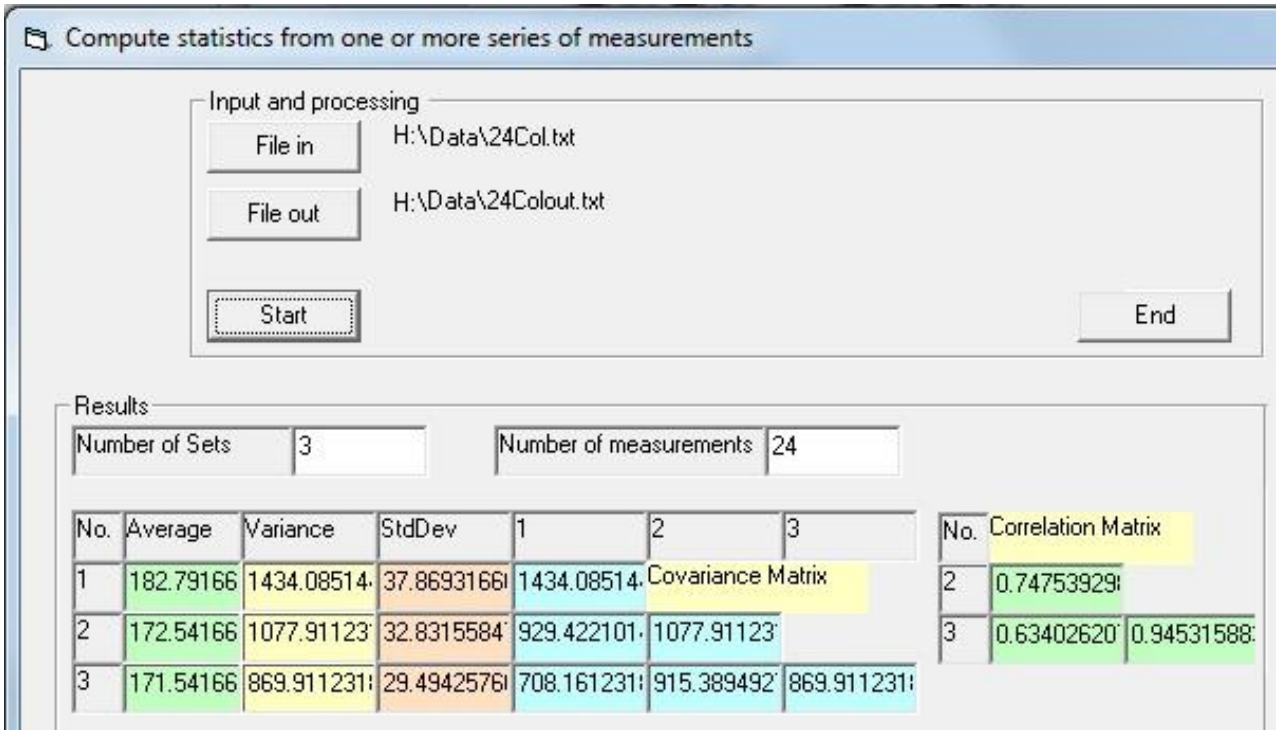

Figure 20 The Form with the graphical user interface.

3. Sample test data. The test data shown above (3 sets and 24-measurements in each set) were processed using the MS-Excel program to obtain final accurate results to be able to test the program under development.
4. The flowchart for the module is shown in Figure 21.

It is quite interesting the evolution of computer programming into *object oriented* form, where humans are actually the *creators* of *classes* and from these classes they create *instant objects*. An instant object is created during the execution of a program and it actually has *birth*, *life* with specific property /

attribute values, data for doing specific tasks and *death* when it is no longer useful or when the program execution is over.

Humans in this respect, as stated earlier, are virtually creators having the authority to: design and create classes, then, from a particular class to give birth to a variety of instant objects, which carry different data values for their

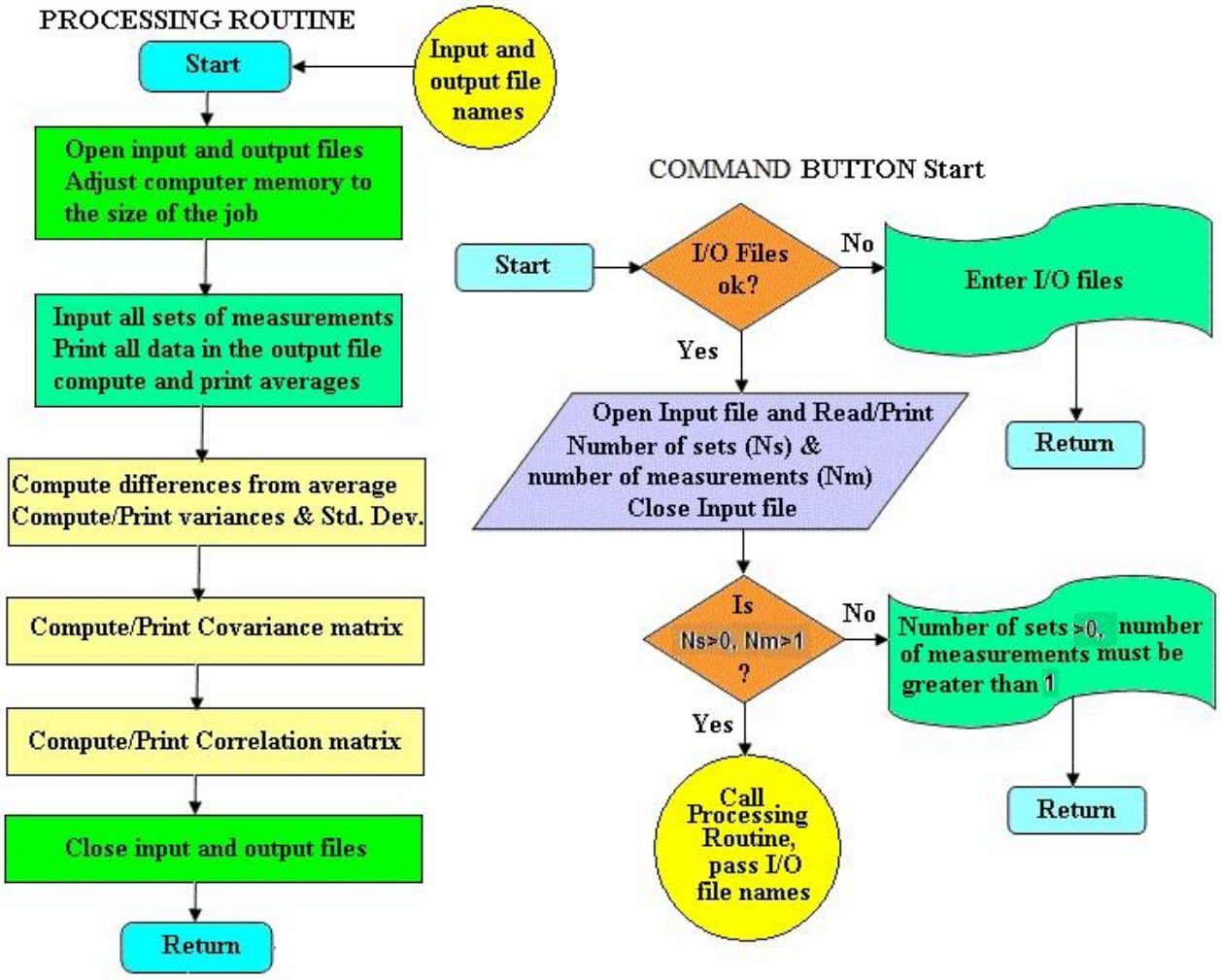

Figure 21. A flowchart of processing routine (left) and Command button “Start” (right).

properties and also are having the authority to end up the life of instant objects.

Object oriented programming is composed of *objects*. The object is a collection of *elements* and *information* which are grouped logically, and functions which are functioning on those elements and information. Elements of information are the *variables*, while *information and data is the content* of the variables. The *behavior* of the information is described by the functions.

Each object has *properties*, *methods*, and, *events* which are key elements in the object oriented programming.

4.7 Mind programming

Educators specialized in certain areas usually try to transfer related knowledge to students using didactic processes. There are many didactic methods to approach this process and the most efficient ones are those used by the mass news media at a national and global level, because they are based on scientific methods to program human mind. One thing that most educators do not realize is that such didactic methods primarily are based on human mind model as developed in Section 2.2. News media work properly on all three mind components, namely; *logic, desire* and *anger*. Their basic business interests are *marketing*, which is based on the creation of desires, even if they are not necessary (excess desire). Certain desires which could promote valuable things, such as education, they say very little things about (defect).

Another effort is to create excess anger to the people by giving emphasis on certain events and urge people to take participation in related actions. Such actions also relate to their business interests, because they usually create noise and therefore more people are interested to participate, thus increasing the client list of the news media. There are certain historical events which

support the anger control of the news media, for example, on October 23, 1998, a Serbian teenage student (Marko Boulatovic) was shot to death by a policeman in Thessaloniki (the largest city in Northern Greece) and the news media said little things about this event (defect). A similar incident happened on December 8, 2008, in Exarcheia Athens, Greece, where a policeman shot a teenage student to death (Alexandros Grigoropoulos) and the news media urged people to be angry and demonstrate their anger in the streets for several days creating all kinds of troubles (excess) and almost every year since then, during this anniversary, the news media have a great success in making people angry and moving to the streets. Some political parties took advantage of this sad event and increased their percentage of votes. News media mostly will implement anger for destructive actions and very rare for constructive actions. It is up to the educators to understand that anger is constructive if used within certain limits controlled by logic to support logical reasoning or for self-defense.

The greatest success of the news media is on controlling human logic. Specifically, on subjects they want to give emphasis, they have a list of people with certain biases and let them create biased opinion to the people (bias). If a subject has many logically stable supporting arguments, but it is against the interests of the news media, then they try to approach it with excess logic creating confusion by making circles around the subject without any specific conclusion. There are other things vital to the people, which need logical analysis and the news media do little about it (defect). For example, the memorandums the Greek government signed for controlling public debt, was not given time to analyze its terms of a working plan and as a result of it did not work, or better, it worked against the public interests. The interesting thing about the news media is that they supposed to make people aware of what is going on in an unbiased manner as required in a democratic system,

but usually they misinform people, i.e., because they are themselves in debt and their lenders require from them certain biased opinion actions.

Besides the news media there are several other structures at the national and international level, which use the mind models as developed in Section 2.2 to program human mind. Such structures are: Many NGOs, Political parties, unions, religions, social groups, etc. Such structures almost never give emphasis to the Aristotelian midway of virtue, but they promise mutual support to those joining their structure and they try to hide virtue and substitute virtue with *love*. People actually are programmed to have rather love than virtue, but they do not realize that excess love is a disaster because justifies, for example, a thief who loves your wallet to take it from your pocket. Therefore, love to be a virtue must be within the Aristotelian midway limits, otherwise there are a lot of bad examples with excess love and with deficient love. One such example is the fellow who slaughtered his wife because he loved her too much, another example is a mother who closed with cotton the openings around the door and the window of her son's room to protect him from cold and the kid died from lack of oxygen. In addition, some of these structures in order to neutralize *logic*, introduce metaphysical beliefs and divide people to believers (friends) and unbelievers (enemies). In this respect, a believer has no right to ask questions, otherwise, is considered an enemy, like all unbelievers, with the worst kind of consequences much worse than barbaric actions.

Therefore, it is absolutely necessary that the educator has to know very well the mind models developed in Section 2.2 and use them to deliver education. Education has to develop the ability to the citizen to understand what is excess and what is defect in logic, desire and anger, which control any action and be aware on passing through legislation (democratic procedures) the

necessary limits to be protected and at the same time help all these structures (NGOs, Political parties, unions, religions, social groups, etc.) to minimize their bias and perform within such limits in order to promote freedom and quality in life.

Furthermore, education must make adjustment to all didactic processes by adopting the mind models developed in Section 2.2 in an effort to help the development of virtuous people. This part needs a constant development and educators have the opportunity to go deep into the anatomy of human brain to promote the effort of understanding what is according to rules in Nature and what is not. It is a pity that criminals are the ones who use the mind models developed in Section 2.2 to distort internal balance of a person and create confusion as afar as wrong and right is concerned, while the educators ignore it and therefor, they do not use it to create an optimum performance constructive and healthy mind.

The worst mind programming which eliminates logic and creates fanatics with excess desire and anger is performed by religions. Most crimes against humanity in the past and the present are committed by religious fanatics. The interesting thing is that the authorities look at the individuals they commit the crimes and they do not look at the religious mechanisms they are training them or furthermore, they do not look at the religious scripts urging them to commit such crimes, usually with generous returns in “life after death”. Notice that the answer to the question “what is after death?” is very simple and it is: “the same as it was before birth”.

4.8 Justice

According to Aristotle (Nikomachaen ethics E-10)

…κρατίστη τῶν ἀρετῶν εἶναι δοκεῖ ἡ δικαιοσύνη… ἐν δὲ δικαιοσύνῃ συλλήβδην πᾶς' ἀρετὴ ᾽νι …
(top virtue is Justice …. Justice contains all virtues).

Today, most people think that the highest power in the universe is the destructive power of human mind. People do not understand that according to the rules in Nature, which control the universe, the opposite happens; the constructive power of human mind is on the same side with the rules in Nature. Therefore, the effort of justice is to maintain equilibrium being the most significant rule in Nature and for this reason justice is represented as holding a balance machine. This subject is quite interesting and discussions have been made through the centuries, mostly concluding that justice is to serve the interest of the most powerful. Considering the powerful to be the one with higher destructive power. The following text is focused on two dialogic situations concerning justice in Plato's *Republic*. In the first situation, Polemarchus, one of Socrates' students, supports Simonides' opinion that justice is: … *to tell the truth and give back those things we owe*..., whereas the Socrates' answer is analyzed in 9 absurdities of this opinion. In the second situation, Thrasymachus, another student of Socrates, supports the opinion that justice is: … *the interest of the most powerful*..., while Socrates' response, is analyzed in 11 absurdities of this opinion. Let us follow the discussion:

Justice is to tell the truth and give back those things we owe.

(Polemarchus supports Simonides' opinion).
Socrates' answer is analyzed in 9 absurdities as follows:

1. If we borrow a gun from someone and this person develops psychological problems, then in order to be just we must lie to him so not to give him back the gun.
2. To give back things we owe under the condition that they benefit the friend and will not harm him means that it is right to do good to a friend and harm the enemy. Since in the battle you defend friends and you simultaneously harm enemies, so the just is useless during peace.
3. In time of peace, if justice is essential for fair transactions, it means that if someone needs to make a transaction -for example, to build a house- he should then get a carpenter and not a just.
4. With regard to the transaction where justice is useful, that is, if one gives things or money for safe-guarded, and then is asking to get them back, it means that justice is useful for objects we do not need, that is, it is for useless things.
5. If one is an expert in safe-guarding things, then is usually also expert in stealing those things. Hence, if justice has this meaning, that is, keeping and giving back things, then the theft is just.
6. Doing good to friends and harming enemies creates those conditions during which justice harms friends in case there is a misperception of who is the friend.
7. Because characterizing who is a friend or an enemy is subjective and many times false, it is as if we accept that justice can harm friends and benefit enemies.
8. Accepting that a friend is always a good person and the enemy is always a bad, then harming the bad person because he is unjust will make him even more unjust, as a mad dog that becomes madder when you punish it.
9. Since the just person is considered a person of virtue and good, should not do any harm to anyone in any case.

Justice is the interest of the most powerful (Thrasymachos' opinion)
Socrates' answer is analysed in 11 absurdities as follows:

1. If an athlete who is stronger than other people has interest in eating beef because it is good for him, then as being strong would impose such a rule upon all other people to eat beef.
2. If we accept that powerful people make up the government of a country, this government may legislate by mistake laws that are against its own interest. Then the citizens should obey the law and hence they will be against the interests of the powerful with the urge and imposition of the powerful.
3. If we accept that the powerful person is perfect and makes no errors, or even if making some errors no one dares to tell about, then we will see that the powerful actually works for the interests of other people. Let's take a doctor, for example, who is perfect in the job and is more powerful than the patient. Nevertheless, the doctor works for the interest of the patients and imposes rules (i.e. prescribes medication) on them to get well. The captain of a ship does the same thing, when taking care of the sailors. Thus, the government does the same thing by taking care of the citizens.
4. If those strong people who exercise power had indeed profit, they would not ask for wage or salary.
5. Power does not attract worthy people and, while they wouldn't like to serve others, many times they take posts of power enduring thus this punishment, so that those posts are not taken by unworthy people.
6. If we accept that whoever is unjust is intelligent, then by becoming powerful for this reason becomes just. This means that creates those conditions that other people who are more unjust than him can displace him. Here, the absurdity is that the unjust is the only one who attempts to

become more unjust than that person who is as unjust as he is, while the just does not attempt to become more just than the person who is also just. He rather tries to become more just than those who are unjust. For example, the doctor does not attempt to be more doctor than another doctor, but rather from an individual who is not a doctor.

7. Wherever injustice is committed, it gives birth to disputes and hatred that are directed against the interests of the powerful.
8. The unjust powerful, since he wants to be unjust to all people, will be unjust fatefully with himself too.
9. A gang that commits crimes with illegal acts, its members should be fair and just while sharing the profits of these acts. Consequently, totally unjust people are not able to succeed in doing something, i. e. a robbery.
10. If we accept that Nature is just, then the powerful is the enemy of Nature (usually goes against the rules in Nature).
11. If we accept that justice can be delivered by those who are both unjust and powerful, it is as if we accept that eyes cure the sense of vision with the opposite of the ability to see, that is, with blindness.

The educator in the first place has to understand the rules in Nature, particularly the one of equilibrium and must try to relate these rules to justice. Notice that equilibrium controls the well-being behavior of all objects in the universe and therefore, Justice as a Goddess in Greek mythology is represented as holding a weighting machine to deliver justice. For example, if the stomach has more acids than necessary, it loses its balance and becomes sick, if a planet, like Earth, gets out of the bounds of its orbit, it loses its balance and it may collide with the Sun or get lost in space. Therefore, educators must help the effort for the development of a virtuous human mind with high constructive power to be aligned with the rules in harmony with Nature .

4.9 Agriculture

As discussed earlier (Section 4.3), the human body is a biological structure and first of all, needs food to build up and for maintenance. On the other hand, food constitutes the basic substance of survival and, thus, securing food has a direct impact on the freedom of the person creating fewer compromises and dependencies. A while ago, food was a criterion for dividing people into higher or lower classes, although in most cases the people of the lower classes had much better quality of food than those of the upper class. Today, the quantity of food has increased, while the quality has been significantly dropped. For example, although most fruits look big and nice, they have lost their natural taste and aroma. Nowadays, better quality of food is enjoyed by those who have a chance to grow up their own agricultural products and prepare the food in a traditional manner and by those who prefer organic products.

The ancient Greek (Hesiod: Erga kai hemerai 230-235, see also Hatzopoulos J. N., 2010a) is stating:

… τοῖσι φέρει μὲν γαῖα πολὺν βίον,
(… mother Earth get us much of wealth. Actually, he talks about the agricultural techniques, explaining the reasons to be used).

Aristotle and Theophrastus study the plants trying to develop scientific knowledge on agricultural matters. Aristotle in Politics (Politica) D 1296b 25, is saying that see also, Zouvas Panagis, 1959:

… οἷον ἐὰν μὲν τὸ τῶν γεωργῶν ὑπερτείνῃ πλῆθος, τὴν πρώτην δημοκρατίαν …, (farmers develop the best kind of democracy if they have the majority of votes).

Xenophon in Economics D-25 is saying that:

… ἔφη ὁ Σωκράτης, ὅτι τῆς γεωργίας οὐδ’ οἱ πάνυ μακάριοι δύνανται ἀπέχεσθαι. ἔοικε γὰρ ἡ ἐπιμέλεια αὐτῆς εἶναι ἅμα τε ἡδυπάθειά τις καὶ οἴκου αὔξησις καὶ σωμάτων ἄσκησις εἰς τὸ δύνασθαι ὅσα ἀνδρὶ ἐλευθέρῳ προσήκει. (Socrates said, agriculture is the most pleasant and useful occupation, increasing the income, exercising the body and creating free people – by knowing the limits of freedom).

In the same book, Xenophon is stating that when agriculture is making progress, then, most other occupations make progress as well. He is also emphasizing that it is very easy to learn the agricultural techniques and methods. Generally speaking, in ancient Greece, agricultures were considered the safest and uncorrupted class to maintain the political and ethical values.

Today people have many technological means at their disposal so that with minimum effort they can develop themselves many of agricultural products that they consume and this would also help professional farmers to improve their products, getting more in the area of organic agriculture. What is needed is a piece of land ranging from 50 square yards to a few acres and the use of simple agricultural methods. Decisive role to succeed in such an effort plays, education, which must put the effort to cultivate optimum constructive minds towards this direction. The entrepreneurship with agriculture, as stated above for ancient Greece, helps the person of any age to actively participate in the

changes of the annual cycle of Nature, to get a lot of satisfaction from creating crop after having put such effort into cultivating the soil of the generous Mother-Earth, and to feel more freedom because he/she has secured the supply of food. Beyond the physical exercise that this effort requires, and the satisfaction received from creating crop through, there is a quality-controlled process that develops crop to be used for the preparation of healthy food.

Recently I spread some seeds of broad beans and peas in an area about 10x10 meters under a wider area of an acre of olive trees. Then I used a 500 Euros tiller gas machine to pass over the seeds just at one time, it took me about half an hour. This happened in December and I did nothing else. Between May and June, I had a lot of fresh crops. I gave the fresh crop to many friends telling me “they never had such a delicious taste” something I also practiced from my wife’s cooking. We also made a lot of dry crops to cook in the winter time. Very important also was the fact that beans store nitrogen in their roots which works as a fertilizer to the olive trees.

If modern people would think of a hypothetical enemy, then the first thing that such enemy would do, would be that he/she would plan to neutralize the human mind (*soft power attack*). The human mind has a universal power capable of winning any enemy, and for this reason the enemy of humans - in this case a hypothetical enemy - would be afraid of human mind and make plans to take it out of his/her way. Thinking of the easiest way to neutralize human mind, it would be understood that alteration of food has a direct impact on this plot. What methods can be used to alter food is a major issue, and there are a lot of experts who give a complete answer. In this document, some current examples will simply be provided such as the production of questionable ferments leading to the sickness of “crazy cows”, the

uncontrolled use of pesticides, the ambiguity and uncertainty of genetically-modified foods, the uncontrolled use of food preservatives, the privatization of seeds, etc. Parallel to modifying foods, the hypothetical enemy would probably try to enter into the programs of elementary and secondary education so that there will be no agricultural courses, and, if they exist they will be offered in such a way that pupils will abhor agriculture. If children are taught about agriculture in the family and at school appropriately and systematically, then they would appreciate better the generous Mother-Earth and will take care of producing better quality of food. At the same time, they will have better feelings about Nature and the natural environment, and they will be more aware of preserving the quality of life (Manolas Evangelos, 2006).

4.10 Energy aspects

Education on energy aspects is vital for the survival of the planet. Planet Earth for many years of evolution managed to gather excess carbon dioxide and hide it in a liquid petroleum form inside its intestines. For many years in the past and today uneducated people eager to make easy and quick profit uses the destructive power of their mind to take petroleum out of the hiding place Nature managed to store it and release the carbon dioxide in the atmosphere. The resulting climate change and the rise of temperature at global level do not make any difference to them that they also will be victims of this imbalanced action.

It is very easy to educate people to use minimum energy consumption without affecting the quality inf life. On the other hand, there are so many other energy resources, such as Sun wind, sea waves, geothermal, hydraulic, etc.,

which do not make any harm or damage to the environment and the question is why they are not used to cover 100% of all energy needs.

When electricity was invented, electric cars were manufactured, but from there on up today, only a few cars are using electricity, why? The answer is education, people have to understand the consequences of destroying the atmosphere of this planet. Some say that, at the present nothing happens, so things continue to work o.k. This is not truth, because if things go out of the rule “balance” in Nature (out of the specifications in Nature for sustainability), then unexpected non reversible results may happen. Earth-science models indicate clearly such results, which are irreversible and may destroy, in a short period of time, life on this planet.

5. Constructive and destructive energy of mind

As analyzed in preceding Chapters and Sections, the human mind is hosted within the human brain, which is a neuron based structure (Hatzopoulos J. N., 2010b). Biological neurons are formed to process and store information and control vital structures and organs within the human body, acting as a parallel processing computer. They have many similarities with neurons simulated in electronic computers in terms of training and functioning, they differ in speed and structural material. Therefore, the human brain is programmed either from inherited genetic software, and/or from the environment the person is growing and living up. Consequently, human mind could grow either to have an educated optimum constructive action, or being uneducated and using its destructive power. The use of destructive power, as designed in Nature, is only for *self-defense* purposes, while the use of optimum constructive power is based on the equilibrium that *logic* checks and balances the *desire* and *anger* within the Aristotelian *midway of virtue* limits. We may say that if things are evolving according to rules in Nature, then human actions may work out to obtain *quality in life* and do *exploration*.

We have to understand that the use of the destructive energy of human mind brings quick and impressively destructive results, while the constructive energy is taking a lot of effort and time to bring desirable results. An example would be the construction of a house that takes effort, time and money to build it up. The destruction of a house could take place in a few seconds using explosives. A real example of the destructive energy of the human mind is the destruction of the twin towers in the New York World Trade Center on September 11, 2001, by just a few Al-Qaida persons and each tower became dust in 12 seconds. The interesting thing in crimes against humanity like this one is that the crime investigation does not look at the real facts they cause

the fanaticism to people getting involved in criminal activities like this. They just look at the criminals and one level of organization behind the criminals such as Al-Qaida. However, the roots of the crime being some religious scripts against humanity are left untouchable to be used for the next crime against humanity again and again.

About mind development, there are two examples given below, the one is based on the constructive energy of human mind dealing with scientific exploration and the other one is based on the destructive energy of human mind dealing with the worst kind of globalization, which is happening today.

5.1 Cosmogony

Part of the exploration is to answer questions such as who and how created universe. Although such a question is out of human dimensions, we will attempt to provide an answer being always near the area of logic and use as less metaphysics as possible.

Such an answer was given by the ancient Greeks and we will try to introduce here, an approach documented by Ippocratis Dakoglou in his book *The Pythagoras adoption of Orphic Cosmology*. In this analysis, as shown in Figure 22, there is only one metaphysical entity called *EN* (*One*). The EN as a hyper logic entity provides one element to the conventional logic called *Unit*. Before this happens, it was a state of *chaos* which could be represented by two numbers the one being $\pi = 3.14\ldots$, and the other one being $\Phi = 1.618\ldots$ The π - number would give the shape of the building elements of the universe, such as circular, elliptical, etc., while the Φ – golden number would give the proportion ratios for the harmony analogy of the dimensions of these elements and the distances among them. It is obvious that with these two

numbers there are infinite geometrical figures that can be made and therefore a chaos could only be shown. The introduction of the unit as the third number creates a scaled universe with a certain shape and dimensions.

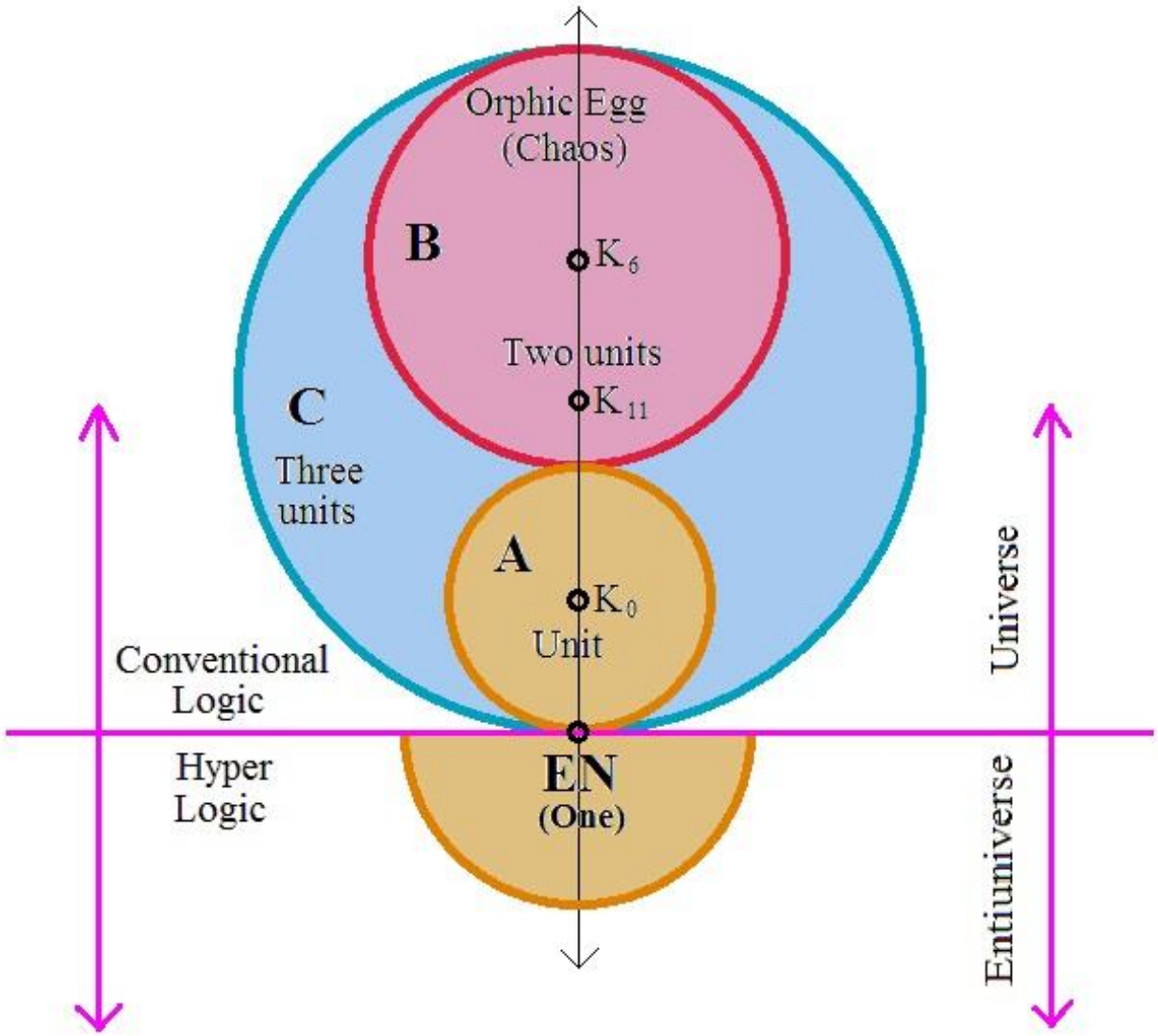

Figure 22. The Orphic Egg and the unit as the starting point of creation of the Universe. Source: Ippokratis Dakoglou, 2009.

This simple description of the Pythagorean analysis to construct the geometric configuration of the Universe, is taking a very complex analysis if taken into consideration the Orphic Egg from Greek mythology. This combined effort creates the trigger and the mechanism of creation and evolution of the universe. Triggering is activated by the Unit fertilizing the

Orphic Egg, which Unit is supplied by the EN and transforms the Chaos into a well-defined Universe. The first thing according to Pythagoras (Ippokratis Dakoglou, 2009), is the development of the geometrical structure of the Universe, which is obtained by the propagation of the spheroid geometrical figures based on the three numbers π, Φ and the Unit, as shown in Figure 22. Analytically, by multiplying the radius of circle K_0 (Unit) by Φ, then the radius of circle K_6 is obtained. Multiplying the radius of K_0 (Unit) by Φ^2, the radius of the circle K_{11} is obtained. This process is continued along the vertical axis, which is called the *axis of the creation* until Φ^{13}. The exponent of 13 is adopted as being the limit, because gravity forces from there on are very loose to hold the material together. Geometrically, in the *conventional logic* area, there are six more *axes of creation*, three on the left and three on the right off the vertical axis and each one of them has Φ^{13} proportions of spheroid geometrical figures. This procedure is governed and called *the law of the harmony of the spheres*.

To understand the meaning of the Unit multiplied by Φ^n, (n=1, 2, …), let us take our planetary system, then, each planet is away from the Sun at a certain distance of (Unit*Φ^n), Where Unit is the distance from the Sun to the first planet which is the planet Mercury. So a planet's distance is calculated as:

$$\begin{aligned} d_1 &= d_1*\Phi^0 \text{ Mercury} \\ d_2 &= d_1*\Phi^1 \text{ Venus} \\ d_3 &= d_1*\Phi^2 \text{ Earth} \\ &\cdots\cdots \end{aligned} \qquad (42)$$

Taking into consideration that $d_1 \approx 35983610$ miles, then the Earth's distance can be calculated as $d_3 = d_1*\Phi^2 \approx 35983610*2.617924 \approx 94202356$ miles. It

must be taken into consideration that such distances are approximate ones because the orbits of the planets are elliptical and not circular and because the fifth planet does not exist, instead there are asteroids in its position, probably an explosion on the fifth planet created the asteroids. Such events change the planetary balance and distances are adjusted not to be following exactly the Equations 42. Taking also into consideration the variance specification limits, where a planet never is following exactly any of the previous orbits, we may seek a fourth number to define the *stochastic model* or the distribution function, which describes the distribution of all orbits of a planet. Such distribution function needs scientific investigation, but if we assume a similar to the Gaussian function as shown in Equation 9, then the fourth number could be the e = 2.7182818284..., which is the base of the *natural logarithms* (*Neper logarithms*).

The geometrical structure is the first thing to study and design in order to create the framework for the construction of the Universe. In a similar way building a house, drafting plans on paper define the geometry which is materialized by the frame of the structure, which is either from steel, or concrete, or wood, or some other material to provide the geometric configuration of the building. From there on there is a lot of work to put the walls to form the rooms, put the installations and all other accessories, utilities, furniture and decorations. Therefore, the Universe is formed immediately after the trigger, which takes place by the fertilization of the Orphic Egg. This event creates a kind of explosion quite similar to the *big ban* and out of the Egg, according to the Greek mythology, come several other elements such as *ether*, *time*, *light* and *Eros* (*law of gravity*). According to Pythagoras (Ippokratis Dakoglou, 2009), these elements are functioning altogether under the activation of ether. Ether actually is presented having a constant flow defining the cosmic time and composed of *two opposite spirals*

in a similar way as DNA molecule structures are, with one big difference that spiral units are growing in diameter in a divergent way as the ether flow propagates according to the *law of the harmony of the spheres*. Ether creates light and material particles and gravity and electrical fields. Ether is a substance not detectable by human scientific process yet. For this reason it will not be further discussed here.

It is worthy though, to look at some other interesting, constructive education aspects of the Pythagorean[4] school, which can also be adopted today by the official school system. One such aspect to give emphasis is that before students would go to sleep at night, they would ask themselves the following questions:

«Πῆι παρέβην; Τί δ' ἔρεξα; Τί μοι δέον οὐκ ἐτελέσθη;»
(What I did that I should not? What I did that I should? What I should do and I did not?

This is actually a self-evaluating technique for the day, according to the rules in Nature to maintain the integrity in a virtuous person, which is also supported by the Aristotelian virtue, where the effort is to learn from mistakes and try not to repeat them therefor, this is the way to virtue.

Another aspect of Pythagoras education is the following known wise adage:

"*In any way, it must be driven and burnt with fire and with iron and other contrivances the illness of the body, the luxury of the belly, the revolution in the city, the discord from home and foremost the imbalance of all of them*".

[4] There are many developments in Pythagoras school and the effort is to take only the ones they support constructive actions within human dimensions and minimizing metaphysical involvement.

Pythagoras is suggesting extreme actions such as: *burnt with fire and with iron and other contrivances*, to emphasize the fact that we should not allow these individual things to happen by any means. The last piece: *and foremost imbalance of all of them* are emphasizing the equilibrium rule in Nature that must be applied to all of them. Equilibrium also was obtained in Pythagoras school on cultivating the body by exercises working in the gym and the farm and on cultivating the spirit by music. Aesthetics of body, spirit and the environment would integrate the balance and harmony at any school today.

5.2 Globalization

The evolution of science and technology brought people from different nations and cultures together and to obtain a balance several adjustments must be made. In Figure 6 is shown the problem of the real world structure with many groups of a variety of biases with the potential capability to bring fanaticism, conflicts, collisions and wars. The best way to achieve equilibrium, as required by the rules in Nature , is to work towards an *equation for peace* expressed by Equation 11 and at the same time achieving stability of peace by minimizing the parameter K in Equation 12. It is not a very difficult task to obtain such results, provided there is good will to work on this problem. A very easy solution would be each nation to appoint a working group of educated people with minimum bias to find out all kinds of existing biases within the nation, which create fanaticism and potential collisions and propose constructive mandatory education actions to be taken to minimize such biases. Then all such working groups shall meet together under the umbrella of UN and see how peace can be obtained at international level. As a final step, at international level must propose constructive mandatory education actions to be taken to minimize all kinds of biases. It is interesting that most fanaticisms, collisions and wars are created by religious biases and religious

like organizations based on secrecy, mysteries, dogma and manifestos, such as NGOS and political parties. Therefore, religions have a valuable cultural part which must be maintained, but some radical parts inside their scripts must be abandoned. Basically the religious leaders must take themselves the initiative to take out any part of the scripts which is against humanity.

The most serious problem in this approach is the selection of the members of the working groups. Therefore, the democratic method described in Chapter 3.5 will help to create a pool of candidates with strong biography towards education with minimum biases and the final working group will be chosen by a random drawing process.

Unfortunately, this is not happening and we practice the worst kind of globalization. Actually, some uneducated persons behind closed doors are making decisions at global level. They are influenced by those who use the destructive power of human mind to gain political and economic power at global level usually being aligned with religious world dominance plans. As stated in Section 2.3, 0.27% of human actions could be extreme actions for *self defense* reasons. However, there are groups of uneducated vanity motivated people of a smaller than that percentage, who use the destructive power of their mind to gain political and economic power at global level and these are the ones they perform the worst kind of globalization. Some evidence on what is going on are included within official reports as follows: The globe's richest 1% own half the world's wealth:
https://www.theguardian.com/inequality/2017/nov/14/worlds-richest-wealth-credit-suisse
According to Oxfam report just for the year 2017 the 82% of the created total wealth went to the top 1%. Also over the last decade, ordinary workers have seen their incomes rise by an average of just 2% a year, while billionaire wealth has been rising by 13% a year:
https://www.oxfam.org/en/even-it/5-shocking-facts-about-extreme-global-inequality-and-how-even-it-davos

According to Konrad Hausner in his article on 10.20.2011: "147 Unternehmen herrschen über die Weltwirtschaft" ("147 companies dominate global economy").

http://www.theintelligence.de/index.php/wirtschaft/finanzen/3424-147-unternehmen-herrschen-ueber-die-weltwirtschaft.html

These documents indicate that world wealth is totally out balance and therefore, against the rules in Nature. However, there is nothing good to expect for the future as long as this imbalance exists, on the contrary worst things may be expected.

These people to maintain and increase their wealth (13% every year), they work at various levels of destructive activities to maintain slavery over the Earth's population and through such slavery to treat people like animal masses. They control the managing teams in news media, NGOs, Political parties, unions, religions, social groups, etc., and use them to maintain carefully designed certain biases among nations and among people within the same nation in order to exercise the divide and rule slavery method. Most of these people have hidden their incomes in tax free paradises and they do not pay taxes. These people of the global population are acting, as mentioned, against the rules in Nature in a provocative way; they use their economic strength to buy or destroy almost any obstacle against their effort to multiply their profits. Therefore, the only way to face the destructive activities of this small group is a critical number of educated people who will help at global level to promote education and convince those people who use such destructive power that from now on it is against their interests to go against the rules in Nature.

Today's globalization process seems to resemble the story of Plato's Cave (Plato: Republic 514a – 518d):

ἰδὲ γὰρ ἀνθρώπους οἷον ἐν καταγείῳ οἰκήσει σπηλαιώδει, ἀναπεπταμένην πρὸς τὸ φῶς τὴν εἴσοδον ἐχούσῃ μακρὰν παρὰ πᾶν τὸ σπήλαιον, ἐν ταύτῃ ἐκ

παίδων ὄντας ἐν δεσμοῖς καὶ τὰ σκέλη καὶ τοὺς αὐχένας, ὥστε μένειν τε αὐτοὺς εἴς τε τὸ πρόσθεν μόνον ὁρᾶν, κύκλῳ δὲ τὰς κεφαλὰς ὑπὸ τοῦ δεσμοῦ ἀδυνάτους περιάγειν, φῶς δὲ αὐτοῖς πυρὸς ἄνωθεν καὶ πόρρωθεν καόμενον ὄπισθεν αὐτῶν, μεταξὺ δὲ τοῦ πυρὸς καὶ τῶν δεσμωτῶν ἐπάνω ὁδόν, παρ᾽ ἣν ἰδὲ τειχίον παρῳκοδομημένον, ὥσπερ τοῖς θαυματοποιοῖς πρὸ τῶν ἀνθρώπων πρόκειται τὰ παραφράγματα, ὑπὲρ ὧν τὰ θαύματα δεικνύασι. ὅρα τοίνυν παρὰ τοῦτο τὸ τειχίον φέροντας ἀνθρώπους σκεύη τε παντοδαπὰ ὑπερέχοντα τοῦ τειχίου καὶ ἀνδριάντας καὶ ἄλλα ζῷα λίθινά τε καὶ ξύλινα καὶ παντοῖα εἰργασμένα, οἷον εἰκὸς τοὺς μὲν φθεγγομένους, τοὺς δὲ σιγῶντας τῶν παραφερόντων. ὁμοίους ἡμῖν, ἦν δ᾽ ἐγώ: τοὺς γὰρ τοιούτους πρῶτον μὲν ἑαυτῶν τε καὶ ἀλλήλων οἴει ἄν τι ἑωρακέναι ἄλλο πλὴν τὰς σκιὰς τὰς ὑπὸ τοῦ πυρὸς εἰς τὸ καταντικρὺ αὐτῶν τοῦ σπηλαίου προσπιπτούσας; …

(Imagine a cave under the ground with its entrance open to the light far away from the lengthy cave. At the deep end of the cave there are people in the dark from early childhood age tied up at their feet and their neck with chains so that they cannot look around but straight ahead[5] and we may call them jailers[6]. Behind and above them at a distance there is a fire and between them and the fire there is a road above them. Along the road there is a short wall like the one the magicians use to demonstrate their magic tricks[7]. Imagine now, other people to move along this short wall carrying all kinds of objects like animals, furniture, statuses, etc., and these objects are the only ones to be shown above the wall and some of these people are talking, some of them are silent. This situation is similar to our situation because the jailers

[5] This description applies to uneducated people, a total neutralization of their mind tied up with chains.
[6] Only one alternative –straight ahead - Zero degrees of freedom.
[7] A perfect description of the movie theatre, the television and the computer games, which absorb most human mind energy leaving the decision making process to those they use the destructive power of human mind.

cannot see anything else but straight ahead the shadows[8] of the moving objects which are projected by the fire to the opposite the fire cave wall. …)

Trying to translate the original ancient Greek text and comparing it with other translations I found that there is a lot of misleading material in other translations. This means that to continue progress in education, we have to learn ancient Greek.

[8] This is a perfect description of the education process at the 21st century.

6. Conclusions

This work started with some questions related to fundamental for education problems of what is right, what is wrong. We need to know as educators, these limits in order to educate virtuous people in terms of developing the effort to maintain human mind performance within specified error limits. These error limits found to be within Aristotle's midway of virtue and the educator must know in a scientific way where these limits are located, in order to put the effort to develop a constructive mind of optimum performance. On the way to search for these limits, two models related to human mind were developed. The one or internal balance model, is based on Plato's optimum mind performance, where the logic component must check and balance the desire and anger. The other one, human error model, is based on Aristotle's midway of virtue defining a region with upper and lower limits, where the first model tolerate its check and balance acceptable performance. Optimum performance is an ideal situation difficult to achieve and can be used as an ultimate goal for the educator, while acceptable performance provides a wider range of options for a correct action, a correct performance, thus giving many alternatives, which increase the freedom and determine the meaning of freedom.

Another question was the analysis and admiration of ancient philosophical achievements without advancing philosophy to provide the bases to face modern needs particularly in education. The scientific answer in this document was based on the historical event of dark ages, where philosophy was separated from the sciences and had not enough supporting evidence to pursue its objectives. On the other hand and during dark ages, blind faith to script and revelation stories, virtually, minimized the ability of human logic to

respond to its balancing duties. It is therefore suggested that each educator must take the initiative to reunite philosophy with sciences, treating philosophy as the mother of all sciences to include all sciences. It was also stressed out that all modern achievements in science and technology must be used to properly analyze philosophical structures. In this document mathematics were used to develop two models related to human mind performance based on philosophical structures developed by Aristotle and Plato proving that reunification of philosophy with sciences would help to provide advanced solutions to modern needs. The amazing thing is that through these models, we were able to provide scientific definitions, among others, for the following: human error specifications, the boundaries of right and wrong, bias and deception, self-defense, democratic procedures, equation of peace and stable peace, human freedom, the Entity with zero error having virtue expanded from minus infinity to plus infinity.

Furthermore, reunification of philosophy with sciences helps to face another important issue related to brain programming with methods of propaganda, bias and deception. Indeed, human mind is hosted within the human brain, which is a neuron based structure capable of holding information and programming instructions. Neuron structures were presented and analyzed as simulated in electronic computers and their behavior was studied. Therefore, in biological structures the behavior of such neurons is quite similar as far as training and functioning is concerned, with one basic difference related to training time, which is much longer. This happens because the biological cell structure requires a lot of effort to change its protein based programming instructions and information holdings. For this reason brain programming is achieved by a constant repetition, feedback process of lengthy duration, which is the basic method of propaganda.

Reunification of philosophy with sciences gave us the opportunity to study the limitations we have in trying to understand the scientific truth, which can be approached within human dimensions and being at a dynamic state it is based on supporting arguments to provide *analytical rigour* and maintain its strength by undergoing *criticism* and *logical reasoning* (former message at University of Oxford Admissions). Science may help us, among others, to discover the laws in Nature and the rules in Nature, while Philosophy is helping us to conform with these rules and do not go against Nature. Out of this analysis, it was also discovered that evolution is a part of Natural processes and it is mainly attributed to the standard deviation specifications performance governing rules in Nature.

Consequently, we studied the impact of the environment and its human intervention to education, including natural, cultural, social, economic, political and religious environment. In this respect, human intervention is doing a lot of damage to all environments by destroying their naturally balanced character and their aesthetics. The resulting impact of education is that within a healthy environment, people with educated character can be easily found, while in a sick (out of balance) environment, it is quite difficult to find educated people. For this reason it is expected that next generations are going to face a quite degraded environment such as: climate change, planet overheating and deterioration of aesthetics, imbalance on news media information, imbalance concerning social justice, imbalance on political and economic developments, imbalance on religious development by abusing metaphysics and imbalance on developing human mind with optimum constructive performance. This present work provides the scientific basis to get involved on deeper reasons they cause a particular human behavior. Such bases include the neural structure of the human brain and the reunification of philosophy with sciences, which will help to develop ethics based on the rules in Nature such

as of equilibrium. These scientific bases can be used to promote and reform most human science fields. Furthermore, it is very important the education system to reform itself, so that under any circumstances, in terms of environmental concern, to put the effort on developing educated virtuous people.

Having in mind all preceding analysis, then we can put things together to achieve the education of educators, which is the basis to establish a modern education system. Therefore, we tried to provide the minimum knowledge the educator must have to respond to current educational needs which are as follows: Education as the effort to develop an acceptably optimum constructive performance of the human mind as discussed in Chapter 2. Education as a human mind system, hosted within the human brain. The brain as being a *neuron based structure* and therefore susceptible to *programming*. Philosophy as the chief science containing all sciences used to help students *to develop analytical rigour and the ability to criticise and reason logically on any matter* (former message University of Oxford). *Mathematics*, especially *geometry* and *statistics*, to train human mind, expand its capabilities and understand *rules in Nature. Computer programming*, to develop the attitude: as *being smarter than the machine* and transmit this attitude to the students. *Aesthetics* as external and internal beauty and transmit this sense to the students. *Justice* as conforming to the equilibrium rule in Nature. *Agriculture* to control the most valuable material, such as food, to support quality of life.

We have to understand that it is a significant event that a very small percentage of the global population owns most of global wealth. This is a tremendous imbalance regarding rules in Nature and as a consequence, there is the worst type of globalization humanity is facing. Therefore, a much

smaller percentage of the global population is using the destructive power of human mind to design and implement this imbalance. They apply the models related to human mind developed in this document to program and manipulate the human mind. They use the methods presented in Section 4.7, such as marketing to increase human desire, urging mechanisms through the news media to increase or minimize human anger, excess logic or defect logic to disturb logic, excess faith and mutual support to neutralize logic. Propaganda mechanisms are based on these methods and people are actually systematically bombarded suffering a kind of *mind rape or spiritual rape*. This explains the fact that there is no significant reaction to the worst kind of globalization process. These facts must be taken seriously by educators, who must understand the significance of human mind models and its neural structure worked out in this document, so that they must be trained to use them on the one hand to create an immune system for educated people to prevent the propaganda effects such as mind rape and on the other hand to promote education by complying with the equilibrium rule in Nature.

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INDEX

S

T

U

V

W

X

Z

A

M

Π

Φ

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Professor John N. Hatzopoulos, was born in Komiaki (Koronida) of Naxos, Greece. Graduated from National Technical University of Athens (NTUA) and received a diploma in Rural and Surveying Engineering. Ranked the first among the graduates in 1971 and was awarded the Chrysovergion Prize. Did his army service and then worked as a surveying engineer for three years before having been awarded a research assistantship at the University of Washington (UW) Seattle, USA, in 1975. Finished his MSCE degree at UW in 1976 and his Ph.D. degree in 1979, while working on various research

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