# SCIENTIFIC COMPUTING

Tarzan Legović

## PRINCIPLES CONCERNING MAXIMUM SUSTAINABLE YIELD IN ECOSYSTEMS

(Division of Marine and Environmental research
Ruđer Bošković Institute, POB 180, Bijenička 54, HR-10002 Zagreb, Croatia)

Since the Johannesburg Implementation Plan, 2002, a number of legal documents started advocating the maximum sustainable yield (MSY) as a goal of fishery. The most recent is the EU Green Paper on Reform of the Common Fishery Policy (April 22, 2009) which advocates: "adoption of MSY as a management principle"

Review of recent results concerning application of MSY to ecosystems will be given. In particular: one population (well known); n- independent populations; prey-predator; food chains; n-competitors and n-mutualists. Results from analyzing particular food web models shed light on additional complexities. Finally, several principles are proposed for applying MSY policy to ecosystems. The key message is: applying MSY to top predators only, so that the harvesting effort is specific and adjusted to each predator population, is unlikely to compromise persistence of other species in an ecosystem, while for any other application of MSY, extinction of other species is likely to occur. Hence, in later cases application of MSY is not recommended. Instead one should resort to careful monitoring of fishing to sub-MSY intensity so that the persistence of other species is not compromised.

Branko Soucek

## NATURAL PERCEPTUAL UNIVERSAL LAWS (PUL) – BRA = 3.6 MS; AMA = 25 MS; MA = 175 MS; BRAMA = 1225 MS – USED IN THE LIFE, BUSINESS AND SCIENTIFIC COMPUTING

(IRIS, Via Lupo Protospata, 10, 70126 BARI, Italy)

**Abstract**

BRA = 3.6 ms , AMA = 25 ms , MA = 175 ms , BRAMA =1225 ms are the natural perceptual universal laws explaining the animal and human cell brain, mind and sex.. They explain the neural and behavior time sequences and related waves. Equations are a set of harmonic waves , one for each possible frequency: 277 Hz ; 40 Hz ( beta gamma range ) ; 5.7 Hz ( experience, consciousness ) ; 0.6 Hz .Computer simulated flocks of Primary Oscillators are in a perfect match with the experimental data: the Evoked Potential EP records, including N400, triggered by verbal stimuli ;

the end plate potentials ; the katydid, firefly and bird nested calls and waves. Applications in the life, business and scientific computing: Better neural diagnosis, research and clinical methods. Cross data banks and related drug testing. Direct brain - computer interfaces ; mind reading machines ; thinking machines .High precision computerized experiments , simulation and system control.

**Keywords**: Perception ;Scientific Computing ; Neural Diagnosis. Brain - Mind Link ;Brain ;Mind ; Universal Law ; BRA ; AMA ; MA ; BRAMA ; Evoked Potential ; Mind - Computer Interface ; Mind Reading Machines ; Primary Oscillator ; Primary Waveform ; Intelligent Bio Informatics.

## Introduction

The short term memory corresponds to the frequency of the alpha-theta range , 40 Hz: (HEBB 1949) , ( KIHLSTROM 1993) . The learning is related to the long term memories (KNOWLTON , SQUARE 1993) , (KOCH , DAVIS 1994) explain the awareness. (KUTAS , HILLYARD 1984) , measure the semantic N400 timing .(SOUCEK 1998) explains the link : quantum mind , evoked potential , N400 .(SOUCEK and the IRIS Group 1992) have introduced the fast computer learning . (SOUCEK and the IRIS Group 1992) are using the dynamic, genetic and chaotic programming. (SOUCEK 2008) presents the new cell, brain, mind, sex theory, in perfect match with the computerized experiments: insects, bird, mouse, human prefrontal cortex. (SOUCEK 2009) extends his theory to the life and business. (SOUCEK 2010) defines the Life Business Manifesto. (SOUCEK 2013) presents the universal laws, with the full text articles with long reference lists, figures, tables and mathematical equations.

This work shows the new experiments and compares the results with the old natural constants without dimension**: Archimed** pi = 3.14159 … ; **Euler** e= 2.7182 … **Planck** , h . It is the quantum of action in quantum mechanics. It is a proportionality between the energy E of a proton and the frequency v of its associated electromagnetic wave : E = h v .The light is quantized into packets of energy “photons “, E= h v .This is the PHYSICAL constant expressed in the quantum physics units (h = 6.6260..e $^{-34}$ m $^{2}$ kg/s). Planck h constant , is far from the quantum neural biology universal laws.

This work merges the new discoveries in the **natural** learning, memory, consciousness and probabilistic computing into **the perceptual universal laws**, **PUL**, with the dimensions in seconds, meters and Hz .The new perceptual universal laws explain the perceptual information transmission of messages in the quantum neural computing, as the origin of life and intelligence.

New natural universal laws open the door for **the advanced research and development**: clear neural diagnosis; better life and business, great precision; perceptual scientific computing and technology.

## Primary oscullators, evoked potentials and understanding

**In the brain, the flocks of agents interact**, without the leader or central control. Like in the school of fish, flock of birds or colony of ants, the behavior is built from the bottom-up. The result is a never ending chaotic self-organization, information compression and quantizing .Most EP segments ask for elaborate approxima-

tion, that involves two or several Primary Waveforms. In this case the waveforms collaborate in parallel or serially, to approximate the segment. For example the sum of three waveforms, properly shifted and scaled presents a good approximation of many complex EP segments. This includes EP triggered by verbal stimuli, containing so called N400 component. The closer in meaning the word is to expected sentence ending, the smaller the N400 wave. The sum of only three Primary Waveforms approximates the N400 wave and it is in excellent agreement with the experimental EP. The Primary Waveform is distributed across the entire EP record. Cutting such EP record into segments would result in a loss of essential parts of Primary waveform. For this reason the entire record is approximated with overlapped Primary Waveforms .What are the relations between Primary Waveforms and neural network structures and processes?. For a long time talking, language, thinking and abstract capacities were attributed to Broca's and Wernicke's areas in frontal region of the left side of cortex. Today neurology focuses also on other cortical and subcortical areas to support the language and talking, which are strictly related to thinking as well as to the memory. Positron-emission tomography and functional magnetic resonance imaging show that the most complex aspects of behavior are not regulated in a single part of the brain, but are based on a distributed support, quantum, dynamic space of agents and oscillators.

**In the Quantum Mind dynamic space**, flocks of agents generate flocks of concurrent sequences, composed of Primary Waveforms. The agents and the sequences interact, through chaotic self-organization. not more discernible in EP record . The resulting EP is not just a filtered sum of the activity of a large set of individual agents or oscillators. Instead, the agents space is determined by just a few dominant modes, binding the underlying agents. These dominant modes produce the dominant components in the recorded EP. N400 record has three dominant components in EP. These Primary Waveforms are related the process of perception. The brain is making hypotheses about the world, and it changes them when unexpected occurrences contradict these working models. The resulting adaptation or understanding is a locking procedure between dominant components: the selective attention; the unexpected hypotheses and the sensory data stream. These dominant components are partially visible in EP as the dominant Primary Waveforms. The resulting sequences form the BRAMA fractal , universal , natural constants:

BRA: BRAND THE FEATURES. Each 3.6 ms is responsible for one information element.

AMA: AMASS THE CHUNKS. Each 25 ms is responsible for one chunk and for associations within this chunk, in the short-term memory.

MA: MASTER THE ASSOCIATIONS. Each 175 ms is responsible for a class of associations with chunks that come from the long-term memory.

BRAMA: UNDERSTANDING. Finally ,each 1225 ms is responsible for a high dimensional overall association and understanding .

The constants are related to their unique frequencies : 277 Hz ; 40 Hz (beta gamma range ) ; 5.7 Hz (experience , consciousness , 1000 / 175 = 5.7) ; 0.6 Hz .

The above time processes and constants des inhibit the structures of windows in the Quantum Mind Barrier. Structure in all levels is based on the 7 information windows: **perceptual universal laws.**

**Self-organization of understanding, consciousness, emotions and knowledge**

The animal and human life grows above the chemical logic (SOUCEK 2013).The life is intelligence .The origin of life and consciousness is in the genetic intelligence universe developed by chance. SO creates the fast evolution. This development within the cell and brain is based on the internal SO processes and languages .Adjusted to the drosophila fruit fly data, SO forms the GENIO fractal ,natural universal laws ,(SOUCEK 2009 ): GENIO = 1250 nm ; BRAG = 3,65 nm ; AMAG = 25.5 nm ; MAG = 178.5 nm ; GENIO =1250 nm.

## Conclusion

What are the guiding forces that cause the axons of developing or regenerating nerve cells to grow, to travel long distances to their specific terminal stations, and among millions of cells to make contact with only a selected few? The answer is : the perception in the cell brain mind and sex ; natural ability to notice things with their senses ; quick to notice and react ; Perceptual natural universal laws. See Fig. 1 – 3.

The animal and human life grow above the chemical logic .The origin of life involves the natural intelligence, perceptual information transmission; perceptual universal laws PUL; including S/Q ,L/P ,T/M:

S/Q=SAMPLING / QUANTIZING, L/P = LOGIC /PROGRAMMING,

T/M=TRANSFORMATION/MAPPING.

**Applications of natural perceptual universal laws in the life, business and scientific computing :** Better neural diagnosis , research and clinical methods ; Cross data banks and related drug testing. Direct brain - computer interfaces ; Mind reading machines ; Thinking machines ; High precision computerized experiments, simulation and system control ; The proper use and accurate timing of the learning actions .Distance measurements to the moon and planets, with great precision.

Natural **conscious** Perceptual Universal Laws – PUL.

Perceptual Information Technology – PIL.

Take the discoveries from conscious PUL and modify them for PIL.

Combinations with the Perceptual Software (Intel 2013), cameras and microphones. “Your face and voice are your passwords “.**Conscious** PIL.

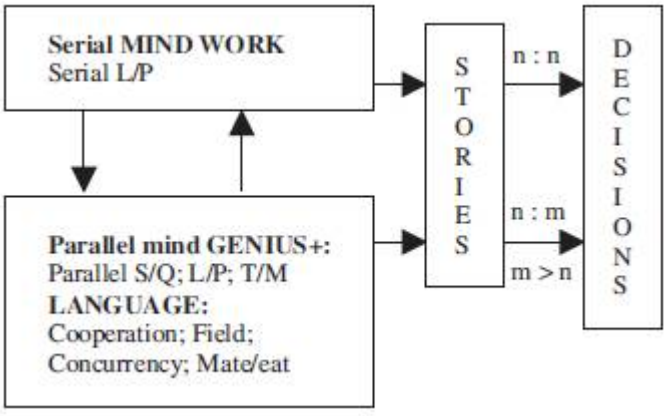


Fig. 1. Human language, decision

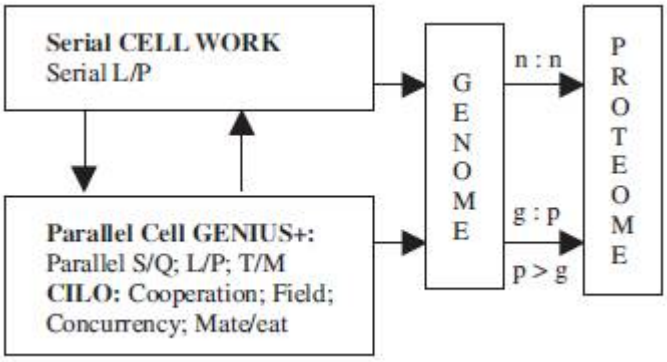


Fig. 2. Cell internal language organization CILO

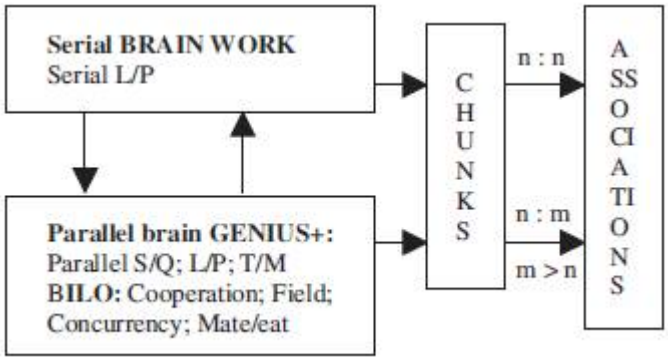


Fig. 3. Brain internal language organization BILO

**References**

HEBB D.O., 1949. The Organization of Behavior. Wiley, New York.

KIHLSTROM J.F., 1993. The Continuum of Consciousness. Consciousness and Cognition 2, pp. 334 – 354

KOCH C., DAVIS J.L. (eds), 1994. Some Further Ideas, Regarding the Neuronal Bases of Awareness In Large Scale Neuronal Theories of the Brain. MIT Press, Cambridge, MA.

KUTAS M., HILLYARD S.A., 1984. Brain Potentials During Reading Reflect Word Expectancy and Semantic Associations. Nature 307, pp. 161 – 163

SOUCEK B., 1998. Quantum Mind – Evoked Potential Link. Per . – Biol . 100 (2). pp. 129 – 140

SOUCEK B. and the IRIS Group, 1992. Fast learning and invariant object recognition, Wiley Inc. New York.

SOUCEK B. and the IRIS Group, 1992. Dynamic, Genetic and Chaotic Programming, Wiley Inc. New York

SOUCEK B., 2008. Self-Organization of Understanding, Consciousness, Emotions and Knowledge : Cell , Brain , Mind , Sex , Life . Per . Biol . 110 (1), pp. 3 – 10

SOUCEK B., 2009. Better Life and Business based on the Cell, Brain, Mind and Sex Laws: LIFEBIZ. Per . Biol . 111( 4), pp. 137 – 143

SOUCEK B., 2010. LIFEBIZ Manifesto : Cell , Brain , Mind. Anesthesia and Operation of the World . Per . Biol . 112 (4), pp. 479 – 480

SOUCEK B., 2013 ,Better Life and Business – Cell ,Brain ,Mind and Sex Universal Laws, Bentham Science Publishers (e-book with the full size articles, figures, tables long lists of references)

S.A. Prokhorov, I.M. Kulikovskikh

## NEW HANDBOOK ON ORTHOGONAL FUNCTIONS OF EXPONENTIAL TYPE AND ITS APPLICATIONS TO CREATE SMALL MEMORY PROGRAMS IN MOBILE TECHNOLOGIES

(Samara State Aerospace University, Samara, Russia)

At this time we release the first part of a book on basic orthogonal functions and its applications [1]. This paper has specific thing for specific readers such as applied mathematicians and programmers to create adequate models, effective algorithms, and source code adaptedfor small memory programming [2] to minimize computational costs. Nevertheless, the handbookincludes new results related to theory of orthogonal polynomials and theory of Fourier series and has a profound academic interest. For this reason we hope that this book will be interested by wider audience.

There are plenty of handbooks that are devoted a special functions and orthogonal polynomials. The best known are: I.S. Gradshteyn, I.M. Ryzhik “Table of Integrals, Series, and Products” (2007); Y.A. Brychkov “Handbook of Special Functions: Derivatives, Integrals, Series and Other Formulas” (2008); NIST Handbook of mathematical functions (2010). However,this book presentssome new definitions and concepts to extend theory of orthogonal functions in practical aspects.

The classical orthogonal polynomials [3] Laguerre $L_k^{(\alpha)}(\tau,\gamma)$ and orthogonal polynomials Jacobi $P_k^{(\alpha,\beta)}(\tau,\gamma)$, which are given on $\tau\in[0,\infty)$ by means of variable change of exponential type $\tau = f(x,\gamma)$, where $\gamma$ is a scale parameter, we will call as basic orthogonal functions of exponential type. In this book we consider some new and well-known mathematical aspects of classical orthogonal functions as well. Basic advantage of the orthogonal functions is an approximation of functionson infinity that can provide very accurate results.

The effective algorithms included in the handbook presented as the following sections:

1) an analytical representation in time domain;
2) basic and extended orthogonality relations in time domain;
3) phase representations;
4) integral representations;
5) an analytical representation in frequency domain;
6) basic and extended orthogonality relations in frequency domain;
7) recurrence relations;
8) interrelations between basis functions;