

The Evolutionary Anthropic Semantic Computational Principle II

Peter Marcer^a and Peter Rowlands^b

^a55 rue Jean Jaures, 83600, Frejus, Var France. email peter.marcer@orange.fr

^bDepartment of Physics, University of Liverpool, Oliver Lodge Laboratory, Oxford St, Liverpool, L69 7ZE, UK. email p.rowlands@liverpool.ac.uk

Abstract. The principal argument for an Evolutionary Anthropic Semantic Computational Principle and a confirmatory prediction methodology in its favour are summarized.

The Argument

Einstein said ‘the most incomprehensible thing about the universe, is the fact that it is comprehensible’. However, this key (fact) to which Einstein directs us (of the accelerating widening of scientific understanding through human intelligence) can be explained, if intelligent life exemplified by the human brain, is not some fluky optional extra to the cosmos, but the result of a **predictable** evolutionary staircase of natural hierarchical structural complexity (testable at each stage against already established and future experimentally validated scientific fact) that arises from an universal computational organizational principle (UCOP):

i) which specifies the origin of the universe as an empty state (i.e. is the boundary condition essential to the solution of a physical problem) (Rowlands and Diaz, 2002; Diaz and Rowlands, 2005)

ii) which gives rise to the desired staircase of evolutionary complexity (Rowlands and Diaz, 2002; Diaz and Rowlands, 2005), explainable as a well defined quantum thermodynamic process in terms of the Quantum Carnot Engine (QCE) (Scully *et al*, 2003) and

iii) which has a computational order code, that of the nilpotent generalization of Dirac’s famous quantum mechanical equation, $D(N)$ see diagram I, **predicted** from the principle itself (Rowlands and Cullerne, 1999; Rowlands and Diaz, 2002; Diaz and Rowlands, 2005), where this order code specifies the fundamental level of quantum mechanical structure ‘nature’s building blocks’, see diagram II in terms of which all further hierarchical levels of the universe’s architectural complexity are described and are decomposable. ‘Decomposable’ because in the entangled quantum universe described, each quantum subsystem’s interaction with the rest of the universe must and is taken into account in

describing its behaviour by the **calculable** use of the mathematical criterion nilpotent, as is the case in diagram II, and

iv) where $D(N)$ **predicts** the initial simultaneous emergence by spontaneous symmetry breaking from its empty state (Rowlands, 2004), of $3 + 1$ relativistic space-time and the strong, weak, and electromagnetic (inertial) quantizations including spin of Standard Model elementary particle physics (Rowlands, 2006) – ‘the building blocks’ diagram II as currently experimentally validated.

Diagram I

The nilpotent generalization of Dirac’s famous equation $D(N)$

$$(\mp \mathbf{k} \partial / \partial t \pm i \nabla + jm) (\pm ikE \pm i\mathbf{p} + jm) \exp i(-Et + \mathbf{p} \cdot \mathbf{r}) = 0$$

where E , \mathbf{p} , m , t and \mathbf{r} are respectively energy, momentum, mass, time, space and the symbols ± 1 , $\pm i$, $\pm \mathbf{i}$, $\pm \mathbf{j}$, $\pm \mathbf{k}$, $\pm \mathbf{i}$, $\pm \mathbf{j}$, $\pm \mathbf{k}$, are used to represent the respective units required by the scalar, pseudo-scalar, quaternion and multivariate vector groups.

Diagram II

The table of the nilpotents $D(N, X_i)$, where the nilpotent operators $X_i^2 = 0$, but $X_i \neq 0$ specify the calculable quantizations of the experimentally validated particles of the Standard Model of elementary particle physics:-

Baryons (spin 3/2):

<i>inertial</i>	$\left(\begin{array}{c} ikE \pm i\sigma \cdot \mathbf{p} + jm \\ ikE \mp i\sigma \cdot \mathbf{p} + jm \\ -ikE \pm i\sigma \cdot \mathbf{p} + jm \\ -ikE \mp i\sigma \cdot \mathbf{p} + jm \end{array} \right)$	$\left(\begin{array}{c} ikE \pm i\sigma \cdot \mathbf{p} + jm \\ ikE \mp i\sigma \cdot \mathbf{p} + jm \\ -ikE \pm i\sigma \cdot \mathbf{p} + jm \\ -ikE \mp i\sigma \cdot \mathbf{p} + jm \end{array} \right)$	$\left(\begin{array}{c} ikE \pm i\sigma \cdot \mathbf{p} + jm \\ ikE \mp i\sigma \cdot \mathbf{p} + jm \\ -ikE \pm i\sigma \cdot \mathbf{p} + jm \\ -ikE \mp i\sigma \cdot \mathbf{p} + jm \end{array} \right)$
<i>strong</i>			
<i>weak</i>			
<i>electric</i>			

Baryons (spin 1/2):

<i>inertial</i>	$\left(\begin{array}{c} ikE \pm i\sigma \cdot \mathbf{p} + jm \\ ikE \mp i\sigma \cdot \mathbf{p} + jm \\ -ikE \pm i\sigma \cdot \mathbf{p} + jm \\ -ikE \mp i\sigma \cdot \mathbf{p} + jm \end{array} \right)$	$\left(\begin{array}{c} ikE \mp i\sigma \cdot \mathbf{p} + jm \\ ikE \pm i\sigma \cdot \mathbf{p} + jm \\ -ikE \mp i\sigma \cdot \mathbf{p} + jm \\ -ikE \pm i\sigma \cdot \mathbf{p} + jm \end{array} \right)$	$\left(\begin{array}{c} ikE \pm i\sigma \cdot \mathbf{p} + jm \\ ikE \mp i\sigma \cdot \mathbf{p} + jm \\ -ikE \pm i\sigma \cdot \mathbf{p} + jm \\ -ikE \mp i\sigma \cdot \mathbf{p} + jm \end{array} \right)$
<i>strong</i>			
<i>weak</i>			
<i>electric</i>			

Leptons:

<i>inertial</i>	$\left(\begin{array}{c} ikE \pm i\sigma \cdot \mathbf{p} + jm \\ ikE \mp i\sigma \cdot \mathbf{p} + jm \\ -ikE \pm i\sigma \cdot \mathbf{p} + jm \\ -ikE \mp i\sigma \cdot \mathbf{p} + jm \end{array} \right)$
<i>strong</i>	
<i>weak</i>	
<i>electric</i>	

However the critical feature needed to complete the proposed solution, is that the DNA/RNA genetic code constitutes a replication of the UCOP implemented at further hierarchical level of the evolutionary staircase, able to **predict** the code’s double / single helical nucleotide architecture and

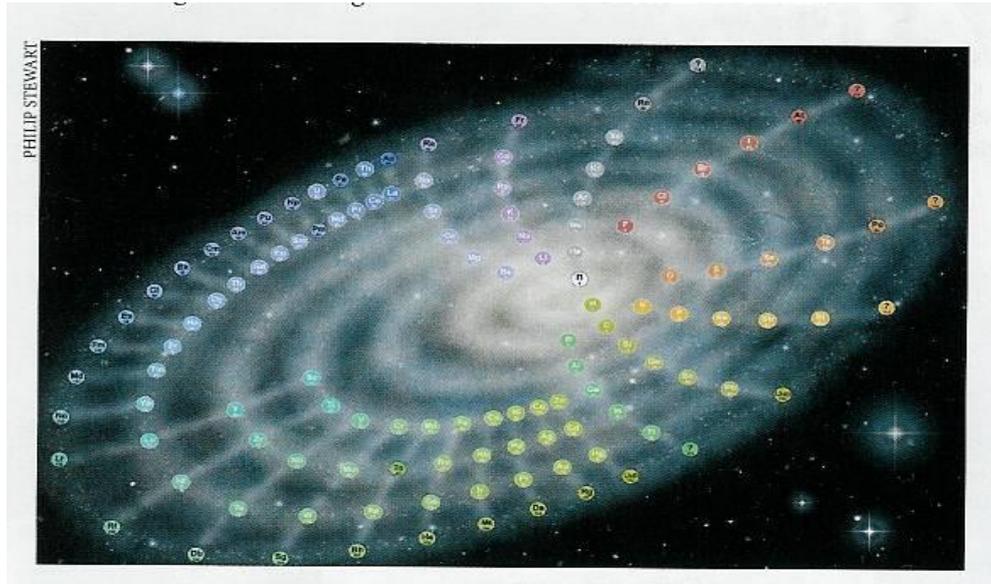
function as this is currently known and understood (Marcer and Schempp, 1986; Gariaev *et al*, 2001, 2002; Rowlands and Hill, 2006; Clement *et al*, 1993). For then, in agreement with the known fact of the genetic code's ability to generically describe both the architecture and functioning of all living systems, including that of the intelligent human brain, the solution proceeds from a simple repetition of this argument. That is, it can be inferred that the human brain (encoded within the genetic code) constitutes a further implementation of the UCOP at a yet further hierarchical level of complexity on the evolutionary staircase. For such a **prediction** – which must describe the human brain's neural / gial structure and its functioning as it is known from experimental observation to be valid (Deutsch, 1985; Eccles, 1986; Noboli, 1985, 1987; Marcer, 1986; Schempp, 1986, 1992, 1993; Hoffman, 1989; Penrose, 1990, 1998; Pribram, 1991; Clement *et al*, 1992; Marcer *et al*, 1997, 1998 a, 1998 b, 2001; Tuszynski *et al*, 1998; Sutherland, 1999; Perus *et al*, 2003) – would explain both the human brain's innate natural semantic language abilities and its capability to understand the universe that conceived it (i.e. its human scientific intelligence) in terms of the UCOP.

The UCOP's Initial Confirmatory Predictions

From diagram I it is seen that the UCOP proposed gives rise to the basic laws of physics in a recognizable quantum mechanical form – that of the nilpotent generalization of Dirac's famous quantum mechanical equation $D(N)$ – as its universal computational order code. This equation **predicts** the simultaneous emergence by spontaneous symmetry breaking from its empty state, of $3 + 1$ relativistic space-time and the strong, weak, and electromagnetic (inertial) quantizations including spin of Standard Model elementary particle physics diagram II as experimentally validated. That is to say these constitute the fundamental level of quantum mechanical structure in terms of which all further higher levels are to be described, so that the quantizations specified are the sole elementary particle sources and sinks of the now $3 + 1$ relativistic space-time quantum field.

Moreover the periodic 'table' (the determinant for the whole of chemistry) of the (atomic) elements for which the universal organization principle predicts a spiral evolutionary atomic staircase, as the consequence of 'fusion' and 'fission' (the universal organizational principle's two hypothesized fundamental computational productions at this hierarchical level of structure where these act on the simplest UCOP composite neutral atomic state / unit, neutronium) is shown in diagram III.

Diagram III



This new spiral presentation for the periodic table begins with neutronium, not usually considered an element (but which cosmically is as abundant as oxygen). It situates hydrogen next to carbon which chemically it most resembles. Such a spiral emphasizing the fact that the elements form a continuum, rather than a series of blocks, is in excellent accord with single heat bath thermodynamic quantum Carnot engine² where the quantum phase θ follows such a time reversal asymmetric spiral behaviour. (*Illustration, courtesy of Philip Stewart.*)

The Proposed UCOP

The UCOP proposed is that of nilpotent universal computational rewrite system (NUCRS) which has a universal grammar as discovered by Rowlands and Diaz. where each new symbol of its alphabet can stand for itself, a sub-alphabet or its infinite alphabet (Rowlands and Diaz, 2002; Diaz and Rowlands, 2005). That is, the NUCRS has required ability by means of the introduction of a new symbol which can stand for its infinite alphabet to replicate itself at further hierarchical levels of the evolution staircase of complexity, as is required above.

All the evidence, we have so far, including that cited below in diagrams I, II and III thus supports the hypothesis that the nilpotent quantum mechanical language description, NUCRS, constitutes ‘Nature’s rules’ so as to formalize the Premise and Mission Statement of the British Computer Society’s Cybernetics Machine Group, that ‘In science, Nature sets the rules, but it must never be forgotten, that it is only because life has exploited these rules successfully for billions of years to our evolutionary advantage, that human brains are able to understand them. The mission, at the physical foundations of computing / information processing if one accepts the premise, is therefore to identify how these rules were exploited

to achieve this end.’ That is to say, the NUCRS turns this premise into an **Evolutionary Anthropic Semantic Computational Principle**, which can indeed be identified with the principal stages needed to accomplish the mission, as set out in the premise. It also strongly advances the claim that the NUCRS generalization of the computational rewrite concept can be taken as a new fundamental computational foundation for both quantum mechanical and mathematical language description, so as to constitute, we would propose, from these stages, a likely basis for a ‘Theory of Everything’. We may thus hypothesize that the universal grammar for semantic quantum mechanical mathematical language description that constitutes the nilpotent quantum mechanical formalism is a candidate for ‘alternative (a)’ in Leggett’s incisive analysis of ‘The Quantum Measurement (QM) Problem’ (Leggett, 2005), which says that ‘QM is the complete truth about the physical world (in the sense that it will always give reliable predictions concerning the nature of experiments) at all levels and describes an external reality’. It also says that the nilpotent methodology must generate all the physical constants so that they can known without empirical determination, in accordance with the statement of Einstein that ‘In a sensible theory, there can be no numbers whose values are determinable only empirically. I can, of course, not prove that dimensionless constants in the laws of nature, which from a purely logical point of view can just as well have other values, should not exist. To me in my ‘Gottvertrauen’ (faith in God) this seems evident, but there may well be few who have the same opinion.’ (Einstein., 1982)

That is to say, that this methodology for prediction would be, we can infer the totally exhaustive means of testing NUCRS’s correctness, at each stage of the evolutionary staircase, where it the staircase will repeatedly exhibit nilpotent closure.

REFERENCES

- Clement, B. E. P., Coveney, P. V., Jessel, M. and Marcer, P. J. 1992. The Brain as a Huygens' Machine, *Informatica* 389-398.
- Clement, B. E. P., Coveney, P. V. and Marcer, P. J. 1993. Surreal Numbers and Optimal Encodings for Universal Computations as a Physical Process Interpretation Of the Genetic Code. *CCAI the Journal for the Integrated Study of AI, Cognitive Science and Applied Epistemology*: 10, 1/2, pp. 149-163.
- Deutsch D. 1985 Quantum theory, The Church Turing Principle and the universal quantum computer, *Proceedings of the Royal Society London*, A400, 97-117.

- Diaz, B. and Rowlands, P. 2005. A computational path to the nilpotent Dirac equation, *International Journal of Computing Anticipatory Systems*: 16, 203-18.
- Eccles J. 1986. Do Mental Events Cause Neural Events Analogously to the Probability Fields of Quantum Mechanics? Proceedings of the Royal Society London, B227, 411-428.
- Einstein A., 1982, quoted in A. Pais, *Subtle is the Lord*, Oxford University Press, p. 34.
- Gariaev, P., Birstein, B., Iarochenko, A., Leonova, K. A., Marcer, P., Kaempff, U. and Tertishy, G. 2001. The DNA-wave Biocomputer. Fourth International Conference Computing Anticipatory Systems. *International Journal of Computing Anticipatory Systems*: 10, 290-310.
- Gariaev, P., Birstein, B., Iarochenko, A., Leonova, K. A., Marcer, P., Kaempff, U. and Tertishy, G. 2002. Fractal Structure in DNA Code and Human Language: Towards a Semiotics of Biogenetic Information, *International Journal of Computing Anticipatory Systems*: 12, 255-273.
- Hoffman, W. C. 1989. The Visual Cortex is a Contact Bundle. *Applied Mathematics and Computation*: 32, 137-167.
- Leggett A.J., 2005, The Quantum Measurement Problem, *Science*, 307, 871-872.
- Marcer, P. J. 1986. Commonsense, what is it? Presented at the British Theoretical Computer Science Colloquium, University of Warwick, March 24-26.
- Marcer, P. and Mitchell, E. 2001. What is consciousness? Van Loocke, P. (ed.), *The Physical Nature of Consciousness*, Advances in Consciousness Research series. Amsterdam: John Benjamins B.V. 145-174.
- Marcer, P. and Schempp, W. 1986. A Mathematically Specified Template for DNA and the Genetic Code, in terms of the physically realizable Processes of Quantum Holography, Fedorec, A. and Marcer, P. (eds.), *Proceeding of Greenwich (University) Symposium on Living Computers*, 45-62.
- Marcer, P. and Schempp, W. 1997. Model of the Neuron Working by Quantum Holography. *Informatica*: 21, 519-534.
- Marcer, P. and Schempp, W. 1998 a. The Model of the Prokaryote Cell as an Anticipatory System Working by Quantum Holography. *International Journal of Computing Anticipatory Systems*: 2, 307-315.
- Marcer, P. and Schempp, W. 1998 b. The brain as a conscious system. *International Journal of General Systems*: 27, 1/3, 231-248.
- Noboli, R. 1985. Schrodinger Wave Holography in the Brain Cortex. *Physical Review*: A 32(6), 3618-3626.

- Noboli, R. 1987. Ionic Waves, in Animal Tissues. *Physical Review: A* 35(4), 1901-1922.
- Penrose, R. 1990, *The Emperor's New Mind*, Vintage, Random House, London.
- Penrose, R. 1998. Quantum Computation, Entanglement, and State Reduction. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences*, Royal Society of London, 356, 1743, 1927-1939.
- Perus, M. and Bischof, H. 2003. The Most Natural Procedure for Quantum Image Processing. *International Journal of Computing Anticipatory Systems*, 246-257.
- Pribram, K. H. 1991. *Brain and Perception: Holonomy and Structure in Figural Processing*. New Jersey: Lawrence Erlbaum Associates.
- Rowlands, P. 2004. Symmetry Breaking and the Nilpotent Dirac Equation, *AIP Conference Proceedings*, 718, pp. 102-115.
- Rowlands, P. 2006. Fermion interactions and mass generation in the nilpotent formalism. *AIP Conference Proceedings*: 839, 225-35.
- Rowlands, P. and Cullerne, J.P. 1999. A derivation of particle structures and the Dirac Equation from fundamental symmetries. Proceedings of the 20th annual meeting of the Alternative Natural Philosophy Association (ANPA), Cambridge. Edited by K. Bowden, pp.155-191.
- Rowlands, P. and Diaz, B. 2002. arXiv:cs.OH/0209026.
- Scully, M. O. *et al.* 2003. Extracting Work from a Single Heat Bath via Vanishing Quantum coherence. *Science*: 299, 862-864.3.
- Rowlands, P and Hill, V., 2006. Chapter 19: Nature's Code, in *Zero to Infinity*, book in process of publication.
- Schempp, W. 1986. *Harmonic Analysis on the Heisenberg Group with Applications in signal theory*. Pitman Notes in Mathematics. London: Longman Scientific and Technical.
- Schempp, W. 1992. Quantum Holography and Neuro-computer Architectures. *Journal of Mathematical Imaging and Vision*: 2, 279-326.
- Schempp, W. 1993. Bohr's Indeterminacy Principle in Quantum Holography, Self-adaptive Neural Network Architectures, Cortical Self-Organization, Molecular Computers, Magnetic Resonance Imaging and Solitonic Nanotechnology. *Nanobiology*: 2, 109-164.
- Sutherland, J. 1999. Holographic / Quantum Neural Technology, Systems and Applications. *ISCAS*: 313-334; <http://www.andcorporation.com>.
- Tuszynski, J. A. and Brown, J. A. 1998. Dielectric Polarization, Electric Conduction, Information Processing and Quantum Computation in Microtubules. Are They Plausible? *Philosophical Transactions: Mathematical, Physical and Engineering Sciences*, Royal Society of London, 356, 1743, 1897-1926.