



Eurhythm – Complexity and Evolution

Organized by José R. Croca (Centre for Philosophy of Science of the University of Lisbon & Faculty of Science of the University of Lisbon)

Program

The Principle of Eurhythm about ten years after its initial formulation

J. R. Croca
Department of Physics
Center of Philosophy of Sciences of the University of Lisbon,
Faculty of Sciences of the University of Lisbon

At the First International Lisbon Colloquium for the Philosophy of Science - Unity of Science, Non-traditional Approaches, Lisbon, October, 2006, I presented for the first time publically the communication *The Principle of Eurhythm a Key To The Unity Of Physics*. Now, almost ten after its initial formulation, this principle has undergone a huge development, from pure physics to include all other sciences. Indeed, this organizing basic principle allows us to connect and unify in a beautiful practically all sciences from the so called hard to soft sciences.

Traditional physics is philosophically founded on the Cartesian linear method where the whole is assumed to be the sum of the constituent parts that mix without modification and consequently the action is proportional to the reaction. The eurhythmic approach to understand Nature assumes the inner complexity of the physical entities. Furthermore assumes that the whole is in general more than the simple linear composition of the constituent parts and that a small action may, under certain conditions, give rise to a huge reaction. This is a consequence of the fact that the parts that make the whole due to the reciprocal interaction change themselves in a greater or lesser degree. Only when this change may be neglected, at the scale of description we are interested in, the linear approach may prove adequate.

Bibliography

J.R. Croca, *The principle of eurhythm a key to the unity of physics*, in Special Sciences and the Unity of Sciences, Eds. Pombo, O.; Torres, J.M.; Symons, J.; Rahman, S. (Eds.), Springer, 2012.

- JR Croca, *Hyperphysics – the Unification of Physics*, in *A New Vision on Physis*, Eds. JR Croca and J. Araújo, Centro de Filosofia das Ciências da Universidade de Lisboa, Lisboa 2010.
- JR Croca, *The Unification of Physics*, in *Lógica Universal e Unidade da Ciência*, ed. Olga Pombo, Centro de Filosofia da Ciência da Universidade de Lisboa, Lisboa, 2011, p: 33-42.
- JR Croca, *Towards a nonlinear quantum physics*, World Scientific, London, 2003.
- JR Croca and MM Silva, *Some Fundamentals of Particle Physics in Light of Hyperphysics*, in *A New Vision on Physis*, Eds. JR Croca and J. Araújo, Centro de Filosofia das Ciências da Universidade de Lisboa, Lisboa 2010.

From Physics to *Physis*

R. N. Moreira

Center of Philosophy of Sciences of the University of Lisbon,
Faculty of Sciences of the University of Lisbon

We focus our attention on the ontological and epistemological implications of the more recent results on the study on the foundations of quantum physics. We defend that quantum physics deal with physical systems that are complex, in such a way that they are permanently interacting with their surroundings, and reacting accordingly to the information changed and accordingly to their own structure. The principle of eurhythmy, introduced by Croca, and the world view associated to it, constitutes the fundamental tool we use in our study.

Bibliography

- R.N. Moreira, *The crisis in theoretical physics, science, philosophy and metaphysics*, in *A New Vision on Physics, Eurhythmy, Emergence and Nonlinearity*, Eds. JR Croca and JE Araújo, CFCUL, Lisboa, 2010, pag. 255-312.

Some comments on the reality of particles and fields

Mário Gatta

Department of Mathematics, The University of the Azores
Centre for the Philosophy of Science of the University of Lisbon

In the present day debate concerning realism and antirealism in Science, a major component is provided by competing interpretations of quantum mechanics. Among



these, the dominant ones may seem to lead to a non-realistic position concerning the underlying ontology, not only of particles but also of fields. In fact, considerations of spatial localization, of quantum statistics and of quantum entanglement, among others, in nonrelativistic quantum mechanics, create considerable difficulties for the concept of elementary particle as an objective physical entity to which characteristic as well as dynamical properties can be attributed. On the other hand, quantum field theory seems to deprive quantum fields of any physical reality as well, since these are fields not numerical-valued functions of spacetime coordinates, but rather fields of quantum operators acting on a definitely non-spatial state vector. Consequently, no physical reality would ultimately correspond to our common notions of either particle or of field.

However, the possibility given to us by the exploration of new approaches to the quantum phenomena, in the spirit of some of its founders, such as de Broglie, and pursued nowadays by a few researchers along different lines of development, may furnish new elements that could surpass the above mentioned difficulties and return to a vision more in line with an ontology of substances and properties.

References:

- M. Kuhlmann, *What is real ?*, Scientific American, August 2013.
A. Hobson, *There are no particles, there are only fields*, American Journal of Physics **81** (3), March 2013.
P. Milonni, *The Quantum Vacuum*, Academic Press, 1994.
P. Teller, *An Interpretative Introduction to Quantum Field Theory*, Princeton University Press, 1995.
J. R. Croca, *Towards a Nonlinear Quantum Physics*, World Scientific, 2003.
J. R. Croca and J. E. F. Araújo (eds.), *A New Vision on Physics*, CFCUL, 2010.

Localização e globalização em física: uma abordagem com coerência

A. Rica da Silva
CENTRA - Instituto Superior Técnico, Physics Dept.
Av. Rovisco Pais 1, Lisbon Codex 1049-001, Portugal

Wavelet local analysis has recently brought to observational physics many contributions not only because of the unique characteristics of the type of analysis but also because it has allowed the deconstruction of the global Fourier analysis that pervades practically all linear physical models.

References:

- J.S. Ramos, R.N. Moreira, and J.R. Croca. *Non-Linear Schrödinger Equation, Burger's equation and superposition of solutions*, in S.Jeffers G.Hunter and J.P. Vigiier, editors, *Causality and Locality in Modern Physics*, volume 97 of *Fundamental Theories of Physics*, pages 421–430. Kluwer, 1998.
- A. Rica da Silva, *Elementary nonlinear mechanics of localized field*, in *A New Vision on Physics, Eurhythmy, Emergence and Nonlinearity*, Eds. JR Croca and JE Araújo, CFCUL, Lisboa, 2010, pag. 133-174.

Language and Reality

Ricardo S. Salomão Lopes
Universidade Aberta

The first assumption of Hyperphysics is that “there is an objective Reality. This Reality is observer-independent, yet, it is understood that the observer interacts with the very same reality being able to change it and of course of being changed in a greater or lesser degree.” This principle of the existence of an objective Reality explicitly includes ideas, as J. R. Croca recently defined.

Language Planning has evolved from his first steps dedicated to “nation building” to a present framework that was first enunciated by Robert L. Cooper as a tool for Social Change, and recently by Bernard Spolsky as a broader, more flexible management tool, understanding the change of, either societal or diverse sizes of communities, always including, obviously, the individuals responsible for the proposed change.

Language as been the object of study of a science – Linguistics – that has difficulties accepting the inherent social nature of his object, pushing out this social nature of language to an hyphenated science: Sociolinguistics. This is far from peaceful. As A.-J. Calvet has stated, it is impossible to exclude the social nature of Language, therefore, there is no Linguistics that is not Sociolinguistics.

The proposed concepts of Hyperphysics and especially of Eurhythmy can provide an important breakthrough in the understanding of the relation between speech and language, individual and social – use or change through words and languages - and also human immaterial production and Reality.