



A ROUND TABLE ON SCIENCE ,
LETTER AND ART



NIC'S CORNER

FROM THE STARS TO THE MIND

Bruno J.R. Nicolaus < Melanins and Human Brain – Reviewing critically the biological role and Speculating on an unified mechanism > V – Magistral Lecture at the < Congreso Regional Latinoamericano del Colegio Internacional de Neuropsicofarmacologia (CINP) > Lima, Perú 25-29 Nov.2005;

ABSTRACT

Newton's axiom states that all life's systems are run on the same lines of simplicity, as physical phenomena. How can this rule apply to the complexity of human brain and biological systems? [1].

Many organic variegated pigments are found all over the planet. The black or brown pigments of the living world are called **melanin's** from Greek *melanos* = black and some of them are located at different sites of the body, where they are biologically active [2]. Melanin's are stable free radicals containing in their backbone a polyacetylene spine [3] and are closely related to polypyrrole and polyindole.

All melanin's include a three dimensional multi-layer graphite-like aromatic backbone, substituted by aliphatic chains and are composed of amorphous micro particles of different shape and size, which are fundamental to chemical and biological function [4].

All melanin's, especially in the doped state, show a variety of physical properties, like absorption and dissipation of light and

sound, binding of metals and organic compounds, storing of liquids and gases, conduction of electrical current and transformation of light into electric energy. These properties have been related to disparate and sometimes conflicting biological functions, in ways that can be either beneficial or deleterious. This lecture provides a critical review of the numerous and various biological functions

so far attributed to neuromelanin and an attempt to provide a unified theory based on the peculiar physical and chemical properties of the black particle (the neuromelanin cage) [5].

Neuromelanin (*substantia nigra* melanin, *locus coeruleus* melanin, retinal pigmented epithelium or ocular melanin, inner ear melanin, and so on) is not homogeneous, as is commonly accepted, but is made up of different substrate specific black pigments formed by the oxidation of o.diphenols or other oxygenated precursors, like DOPA, CYSDOPA, Tyrosine, Epinephrine, Serotonine, etc.

Ocular melanin is believed to protect the eye by trapping metals and free radicals. This paper shows that this unconfirmed mechanism is a rather fortuitous irreversible molecular accident, which at times may prove itself deleterious.

Albinism often leads to deafness in pets, indicating a genetic correlation. These two conditions are correlated at a molecular level to eye/ ear pigmentation and suggest verifying this hypothesis in normal and albino human individuals.

Skin and ocular melanin are chemically different. However, they are both involved in light absorption/dissipation. The black particle structure (melanin cage) is believed to be fundamental to this process because there is a common bioelectric mechanism. The latter is worth of further investigation. It is also proposed checking how ocular melanin

dissipates the excessive absorbed light (as heat or as current?). It has been claimed that inner ear melanin mutes acoustic waves.

This paper suggests investigating the underlying mechanism and also studying whether this pigment is bio-electrically involved in audiology.

According to numerous authors, *Substantia nigra* melanin is only biological garbage. This view is rejected, and it is stressed that intracellular melanogenesis is a fundamental and genetically controlled physiological process.

It has been repeatedly claimed that the binding of iron, heavy metals, free radicals and harmful chemicals by *substantia nigra* melanin is fundamental to body detoxification/protection.

Presumably, such irreversible and generic binding mechanisms have no true physiological foundation; it is suggested the alternative that, *substantia nigra* melanin acts as semiconductor, transmitting and modulating nervous impulses, in a reversible way. In fact, *substantia nigra* melanin is absent or significantly scarce in two conditions of life in which the coordination of movement is either inefficient (newborn babies) or strongly compromised (Parkinson). To check this assumption, further investigation of *nucleus caudatus*, *putamen*, *globus pallidus*, *substantia nigra pars compacta and reticulata*, *nucleus hypothalamicus* is recommended.

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