Mini Review

Human Visual System involves macroscopic scale-invariants and microscopic quantum mechanics single-photon sensitivity

Abstract

"A half Century has gone by; the general public seems to be lacking a simple Readers' Digest knowledge about human visual system (HVS). In order to ward off wolf eyesight emitting few photons in a dark cavern, we have evolved to separate the energy from the information, as well as adopt the negation of the converse detection logic. To achieve the sensitivity, HVS uses the dark (no light yet) current, discovered by NIH Hagins, to inhibit 100 rods' bundled together by Ganglion integrator by using its own energy firing. We have applied the dark current to inhibit firing, until a detection of a single photon of wolf eyesight by any of the rod bundle. In this short communication, we shall give 2 theorems: macroscopic scale invariants and microscopic quantum mechanics. Now we know why we can see red color while the other animal cannot and why we can detect a single photon while the other cannot. Given the basic deep learning algorithm and possible experiments to verify Quantum Mechanics Uncertainty Principle for HVS single photon detection capability according to the Gold Standard: Double Blind, Negative Control and Sufficient Statistics."

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Introduction

There are about 90Millions rods for night vision distributed about polar-exponentially in the fovea peripheral vision and 4.5 Million cones distributed uniformly in the central fovea area for day vision. They are about 20:1 ratio per eye.[1] As we said, these night vision rods are **not** uniformly distributed **but** in a *polar exponential grid* (PEG) Figure 1A. Also, those day vision cones have their 7 folds Figure 1B drop down to detection the *longer wavelength red color* as the color of fruits are important for our ancestor to lead animals to ripe fruits for more nutrition to support the team. In between there are 4~5 layer identical processing repeated with the same firing resource-sharing algorithm, known as **"On, Center; Off, Surround"** (Math equivalent to a finite difference algorithm): cf. **Deep Learning**.[2] For example: "Layer#1: Edge Extraction"; "Layer#2: Edge Connected or Broken Apart"; "Layer#3: Curvature Exaction of those Connected Edge Object"; "Layer#4: Isolated Object entering Hippocampus for Associative Memory".
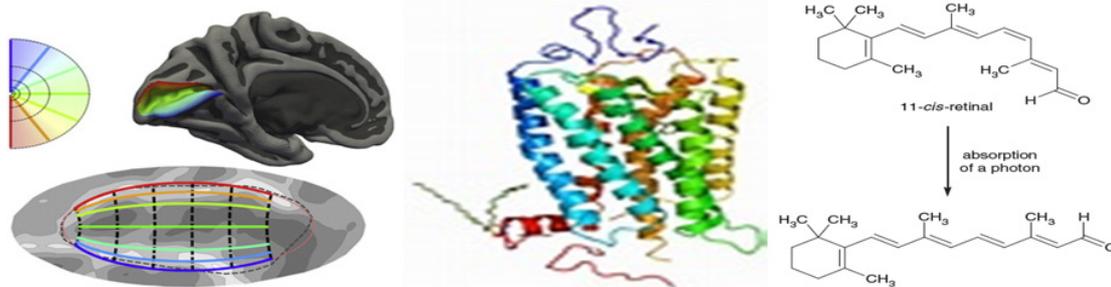
Figure 1 (A) PEG Sensors Distribution, (B) Color Con with dropdown red, (C) A photon causes retinal to change from its 11-cis-retinal isomer into its all-trans-retinal isomer[1]

Theorem: Scale Invariance is achieved by Polar Exp. Grid (PEG) Detectors/Rods Array.

Proof: We achieve gracefully a scale s invariant, $sU = \exp(X); X = \log_{\exp} U + \log_{\exp} s$ **Q.E.D.**

App: Ancient Homo sapiens were chasing during the moonlight a game or mate with a bat on beach, and then a factor of 2 in close up size say $\log_{\exp} 2 = 0.693$ there will be no photon integration challenge for their eyes to aiming and hit at the target head.

Moreover, about 100 rods, x_{100}^{rod} are integrated with a Ganglion neuron of output photon momentum $\Delta P_1^{Ganglion}$

Heisenberg Uncertainty Principle[5]: He began with the plane wave representation: $\psi = \psi_0 e^{\frac{i}{h}(Et-px)}$ in terms Max Planck action constant $\frac{h}{2\pi} \equiv \hbar$. Then he formed its wave package first called by De Broglie matter wave to be localized either photon or particle and discovered $\Delta E . \Delta t \geq \hbar; \Delta x . \Delta p = \frac{\hbar}{a}\frac{a}{2} = \frac{\hbar}{2}$. Given this uncertainty product rule, we realize that we can hardly detect a single photon at room temperature $300 k_B T \cong \frac{1}{40} eV$. The main point is that Homo sapiens have adopted

the fact that the ***energy*** of eyesight photons can be separated from the ***information*** (seeing the wolf eyesight few photons in a dark cavern). In other words, the ***energy*** coming from the rod's bundle integrator called ***Ganglion*** [without the so-called ***dark current*** carried by the simultaneous inward flux of Na+, Ca2+, and Mg2+ ions (discovered by NIH Hagins et al.[3] The dark current inhibits Ganglion from firing its energy to inform Cortex 17 what we have seen from a dangerous wolf's eyesight in a pitch dark cavern. This is what we mean to "***negate the converse logic***", namely algebraically $-X- = +$ (NO x NO = Yes) detection.

$$\Delta x_{100}^{rod}\Delta P_1^{Ganglion} \approx \frac{1}{2}\hbar \quad \Delta P_1^{Ganglion} \cong \frac{\hbar}{2\Delta x_{100}^{rod}}$$

In conclusion, we mention 1963 Nobel Laureates[4]: John Carew ***Eccles***, Alan ***Hodgkin*** & Andrew ***Huxley*** discovered excitation and inhibition in the peripheral and central portions of the nerve cell membrane that seems to support our Quantum Mechanics Uncertainty Principle. Moreover, we have separated the tradition ***Shannon Information Theory*** that the information must be the energy principle, and adopt the energy does not have to involve with the logic, and we have used ***"negate the converse logic"*** in single photon detection mechanism.[6] A double blind negative control and sufficient statistic Gold Standard Experimental tests shall involve a human in aDark room and a flash of weak light quantified by a photo detector in the limit of reducing light intensity toward aSingle photon while human subject push a bottom for seeing or not. Experimental tests shall involve a human in a dark room and a flash of weak light quantified by a photo detector.

Due to the rod's "dark current" did not exist to inhibit the thermal room's blackbody fluctuation-dissipation (as if were a "Ganglion"), a single photon human visibility experiments must be extrapolated when the intensity is approaching toward zero, cf. (Figure 2).
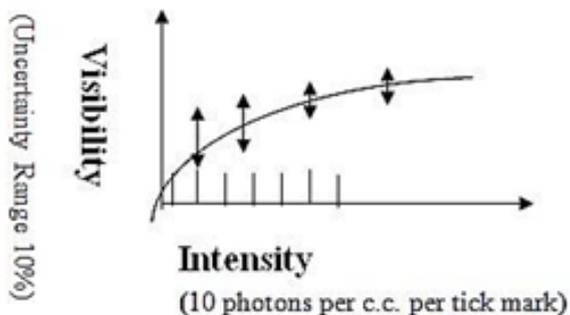
Figure 2 Experiment verification In the Intensity limitation toward a Single Photon to measure Human Visibility (with pushing with Ya or Na button).

Conflicts of interest

The author declares no conflicts of interest.

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