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Quantum Sound Waves Theory, Application to the Treatment of Quantum Wave' s Information by the Brain During a Teaching- Learning Sequence in a Class Room

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Abstract

A new approach of sound waves named Quantum Sound Waves Theory (QSWT) is presented in this paper. Similar to photons, the quantum particles of light, we consider that sound waves are a flux of quantum particles referred as sonons. Each sonon transport quantum energy equals to hs υ with υ the frequency of the sound wave and hs the quantum sonon constant estimated at 5.842 487 81×10-28 J.s compared with the Planck's constant h = 6,63 × 10 - 34 J.s . In the framework of the QSWT, we describe the brain as a quantized biological matter characterized by ceverlonic levels. Transitions between these levels by cervellons (ceverlonic particles) make it possible to understand the treatment of quantum wave's information by the brain during a teaching- learning sequence in a class room.

Keywords: Quantum Sound Waves Theory (QSWT); sound waves; sonons; quantum sonon constant; ceverlonic levels; cervellons; quantum wave's information; brain; teaching- learning sequence.

Introduction

Phonons are well known to be the quantum particles of sound waves in solids and were the subject of many works [1,2]. For waves sound in air and water, sound can be described as a flux of quantum particles like photons for light. Besides, for two decades, the formalism of quantum mechanics has been successfully used to describe human decision processes after the identification of the presence of quantum structures in human cognition [3-5]. In addition, some studies attempt to demonstrate that consciousness and quantum theory are closely linked [6]. Besides, for several years the idea has been gaining ground, but never before has it been supported by such robust evidence: an international team has just confirmed, with brain imaging support, that our thinking follows the laws quantum. We are talking about thinking and not biology: this study says not that the brain and its billions of neurons are a quantum physical system, but that our thinking, the way we process information, the way we learn and about which choices we make, follows quantum logic [7]. In this work, we treat waves sound as a flux of quantum particles like photons for light. These particles referred to as sonons interact with atoms and molecules contained in material (such as air, water, brain, etc.) where waves sound can propagate. In this paper, we assume than the biological matter of the brain is quantized and characterized by ceverlonic levels. The treatment of information by the brain is considered to be due to transitions between these levels by cervellons (ceverlonic particles). This approach makes it possible to understand the treatment of quantum wave's information by the brain during a teaching- learning sequence in a class room. Section 2 presents the theoretical part of the work.

Theory

Definition of sound

Sound is a physical phenomenon characterized by sound vibrations. These can propagate in the air or in water, forming sounds. Sound is measured in decibels and is characterized by two parameters: its height and its intensity. Pitch (bass, treble) is associated with frequency and is measured in hertz (Hz); the lower a sound, the lower its frequency (example: 100 Hz), the higher it is, the higher its frequency (example: 10,000 Hz); the frequency is the number of oscillations or the number of periods T per second of a periodic vibratory phenomenon ($\upsilon = 1/T$). The intensity (strong, weak) is measured in decibel (dB). The decibel noted XdB is a unit defined as ten times the decimal logarithm of the ratio between two powers, that means for P1 and P2 (P1≥ P2) powers, we obtain XdB = 10 log10 (P1/P2). The average human ear perceives sounds in a certain frequency range, from approximately 20 Hz to 20,000 Hz. Low frequencies range from 20 Hz to 200 Hz, mid or medium frequencies from 201 Hz to 2,000 Hz, and high frequencies range from 2,001 Hz to 20,000 Hz. For a given sound, there are several frequencies including the fundamental frequency f0 and higher frequencies, called harmonics 2f0, 3f0, etc. Ultrasound is sound vibration at frequencies above 20,000 Hz. These sound waves cannot be detected by the human ear. However, they are audible to certain animals, such as bats, dolphins and whales [8]. The sound can be pure or complex. Pure sound is made up of only one frequency (the equivalent of a whistle, for example). Thus, complex sounds are natural sounds, comprising several sounds that can be separated during spectral analysis. As for noise, it is a set of sounds without harmony. It results from a complex mixture of sounds of different intensities and frequencies So much for the physical definition. The WHO, for its part, defines noise as an "acoustic phenomenon producing an unpleasant or annoying hearing sensation" [9,10].

Existence of waves sound particles

Sound waves are vibrations that propagate in air or water form sounds. These are then picked up by our ears and transmitted to the

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brain which then decodes them. To put into evidence the characteristics of waves sound as a collection of zero rest mass particle we call sonons, let us take the υ as a concrete example for illustration.

Speech sounds are phonemes. The phoneme is the minimal unit of speech. We cannot divide it, we can only combine it and we recognize this by the fact that, if we change it, the word changes its meaning. "I'm taking a loaf of bread" takes on, in fact, another meaning if we replace the phoneme /p/ with the phoneme /b/: "I'm taking a bath" ». Each phoneme is made up of a spectrum of frequencies, and consonants are made up mainly of high frequencies. Which means that you hear them less well as soon as your hearing declines. If you cannot clearly perceive the difference between /f/, /s/ and /ch/, for example, it is a safe bet that you will have difficulty understanding proper nouns on the telephone or simply a conversation in noise. In the French alphabet, there are 26 letters including 6 vowels (a, e, i, o, u, y) and 20 consonants (b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, v, w, x, z). For illustration, let then consider the sentence.

This sentence is composed of 23 words associated with a lot of number of phonemes. We can first transcribe this sentence in the view point of mathematics. For this, let us put mi representing a word. So mathematically, sentence (S) can be described as a linear combination of words. So, we can write in the form

m_1 = Professor, m_2 = Sakho, m_3= has,….. m_{23} = Senegal.

Substituting *m*i by its meanings, Eq. (1) is written in the shape

S = Professor + Sakho + has + got + its + PhD + in + atomic + and + nuclear + physics + in 2013 + at + the + University + Cheikh + Anta + Diop + of + Dakar + in + Senegal

In the view point of literature, the plus "+" in sentence is not pronounced and one hear just the meaning of sentence

In the view point of the present quantum wave sound theory (QWST), we associate to each word a wave sound frequency. In addition each word is considered to be collection of sonon, each sonon carrying the energy *h*s υ.

The total energy carried by the sentence is then Is a complex sum of sub-frequencies, each sub-frequency being associated to a phoneme. For example, υ_2 is associated to the word Sakho (here a name is considered as a word) contained five sub-frequencies associated to the phoneme S, a, k, h and o. These sub-frequencies cannot be dissociated as they form a whole frequency υ_2.

Let us know moving on determining the value of the quantum sonon constant *h*s (the subscript ''s'' is put for sonon). For this purpose, we postulate that, in air or water, sonon propagating with the velocity *c*s of sound and photon propagating with the velocity of can carry the same energy for the same distance λ.

make it possible to convert sound waves energy to electromagnetic waves energy and vice versa. Besides, Artificial intelligence (AI) can be used to treat now communication between people as an exchange (emission by the mouth, reception by the ears, and treatment by the brain) of information incorporated in sonons propagating in air or water with the velocity *c*s, each sonon carrying the energy *h*s υ. Robots can be used for a test.

Treatment of quantum wave's information by the brain during a teaching- learning sequence in a class room

In our recent work we considered that the brain is quantified and thus postulates the existence of biological particles which he baptized cervellons. The human brain is thus made up of cervellonic levels. The brains are responsible for the exchange of information between the brain (of a learner, for example) and the external environment (teacher, parent of a student, classmates, etc.).

Furthermore, by analogy with the processes of generating laser radiation, it would be possible to show that the human brain (made up, among other things, of atoms) is "quantified" and to analyze the processing of information by the brain as processes of "cervellonic" transitions between quantified brain levels. The brains are biological particles responsible for ensuring the transmission of information throughout the brain. From this perspective, we consider that the cerebral levels of processing and restitution of information are of three types:

A fundamental level of reception of information (example question asked by a teacher to a learner);

An excited level of information processing (learner's level of reflection);

An intermediate level of restitution of the information processed (answer to the question asked).

A relaxation process (elimination of all wrong answers) would occur between the cerebral level of information processing and the cerebral level of emission of the processed information. This implicitly opens up avenues of research with a view to concrete applications of quantum physics in education.

Let us consider the particular case of the interaction between a teacher asking a question to a student. The question asked by the teacher consists of a radiation of information emitted from the mouth (transmitter) of the teacher. This informational radiation propagates in the form of sound waves and arrives at the ear (receiver) of the student. Subsequently, the acoustic vibrations of the eardrum cause the birth of an informational nerve flow which excites the brains at the fundamental level of reception of information. The cervellons pass to the higher level of information processing. Then, after treatment, nonradioactive cervellonic transitions occur (elimination by the brain of any information not compatible with informational radiation) towards the intermediate level of information restitution. Subsequently, radiative transitions (restitution of the processed information) towards the ground level of reception of information. schematically illustrates the envisaged information radiation-brain interaction process. Note that informational radiation is made up of packets of information.

Let us give a concrete example of information radiation-brain interaction in the case of a teaching-learning sequence in class.

Informational radiation (question): four times equals how much? Or 4×2 =?

Absorption of informational radiation (fundamental level): cervellonic transitions

Processing the content of informational radiation: reflection stage

Non-radiative transitions: elimination of results like four plus two, four minus two;

Radiative transitions: answer to the question asked four times two equals eight (it can also be wrong for a student who has not mastered the multiplication table by 4)

Conclusion

In this paper, we have presented a new QSWT of waves sound considered as a flux of sonon, each sonon carrying the energy hsυ, with hs = 5.842 487 81 × 10^{-28} J. s, the quantum sonon constant equivalent to the Planck's constant for photons. Application of our QSWT in the particular case of the treatment of information by the brain during a teaching-learning sequence in a class room open implicitly avenues of research with a view to concrete applications of quantum physics in education. As stated by Koch and Hepp, the relation between quantum mechanics and higher brain functions, including consciousness, is often discussed, but is far from being understood. Physicists, ignorant of modern neurobiology, are tempted to assume a formal or even dualistic view of the mind–brain problem. Meanwhile, cognitive neuroscientists and neurobiologists consider the quantum world to be irrelevant to their concerns and therefore do not attempt to understand its concepts. What can we confidently state about the current relationship between these two fields of scientific inquiry. In addition, there has been speculation for decades about the role of quantum mechanics in the relationship between mind and matter. Far from the nonsense on the subject of the New Age or so-called quantum therapies, researchers are beginning to propose experiments which would, perhaps, one day soon allow us to prove that part of our brain functions like a quantum computer. This is the case of renowned American physicist Matthew Fisher, who has just received funding of more than a million euros for this. This may indicate that the present work can play in great role for applying quantum mechanics in the purpose to understand human being behaviour.

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