

Quantum bits and neural interpretation of information

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Dr Peter Verheyen, DMD from Sola Society & Academy, Vienna University, delves into the world of quantum bits and neural interpretation of information

Consciousness has been shown to be a distinctly biochemical concept, and it appears to be an emergent property of life – the sum of the constituent parts acting in concert creates a new property.

The brain is characterised not only by signal transfer via action potentials but also by chemical information transfer via synapses and neurotransmitters. The glial cells and astrocytes, which were assumed to play no more than a supportive role, now appear to be involved in generating crucial activities as well. This all leads to an organisation of incredible complexity, the complexity from which awareness and self-awareness emerge.

Via the senses, information is sent through the nerve pathways and action potentials to the thalamus. The thalamus is the initial processing unit of the brain. From here, information is relayed via the corpus callosum or white matter to the prefrontal cortex, where it is sifted and sorted and sent on to the trivial centre of the cerebral cortex, ready for any further processing and interpretation needed.

All incoming information has its own centre or centres for processing and interpretation. Of crucial importance here is the precise coordination of the thalamus, the prefrontal cortex and the two hemispheres of the cerebral cortex, as well as their connection via the corpus callosum. Good left–right communication and information exchange between the two hemispheres of the cerebral cortex are indispensable for awareness and self-awareness.

Sensory information and its interpretation by our brain are our only link with the environment – with the reality around us. The way our brain ‘interprets’ incoming information forms our picture of reality.

Colours do not exist

It is in itself amazing that life has been able to organise itself in this way, that it is even able to detect and perceive one of the fundamental natural forces, electromagnetism, and, above all, to measure it with the utmost precision. Life is capable of very accurately measuring wavelengths of electromagnetic radiation that vary by less than a nanometre, and electromagnetism, as such, can be defined as information. For in interacting with electrons, the ejected photon provides information on the interaction that has taken place. Thus, electromagnetic radiation is the transfer of information.

The eye is a measuring instrument. It observes, measures, differentiates and sends information via action potentials to the thalamus and via the corpus callosum and the prefrontal cortex to the visual centre in the cerebral cortex, which is able to process and especially interpret the information it receives. For complex organisms, this was a great evolutionary advantage and of vital importance.

How were photons (electromagnetism) containing information on the living environment to be interpreted in order to use them to interact with that environment? The solution was simple but ingenious. Give each wavelength a 'colour' and it allows every object in the environment to be clearly distinguished. It is possible that when vision first developed it was based on the brightness or contrast of electromagnetic radiation, but this was selected out because colours were superior for perception of the environment and for survival.

We can assert that if there was nothing to perceive and interpret electromagnetic radiation as colour, colour would not exist. Colours are an interpretation of observed information.

The deceptive brain

Information is interpreted in specialised structures of the brain as a 'reality vital to life'. The senses serve as measuring instruments; they perceive, observe, detect and measure and send the information to the brain to be processed and interpreted. But just as electromagnetic radiation has no colour, so too are smell, taste, sound and feeling in the sense of touch, proprioception and our position in space a product of the brain, with the senses as biochemical measuring instruments.

Touch and proprioception place a living organism in a specific spatial position in its environment. Touch also led to the perception of pain, important for promptly interpreting and moving away from harmful stimuli. Hearing permitted direct interaction with the environment at a distance. It can also provide information when seeing is no longer possible – in darkness and at night. The same applies to smells – interaction at a distance.

So much information floats in the air – the dangerous smell of an enemy, the pheromones of a potential partner, the attractive smell of something edible. Even flowers invest a lot of energy in their fragrances to attract bees and ensure their diversity. Flavours, too, were developed not to provide us with culinary pleasure but as an absolute necessity and a factor that enables us to distinguish between edible and harmful.

But just as sight and colours are a by-product of neural interpretation, touch, proprioception, sound, smell and taste have no physical identity but are the product of an apparent world that is vital to life, created by the brain to enable it to interact appropriately with the environment.

Neural interpretation of incoming information therefore does not appear to be based on an objective physical reality. The brain seems to do its best to interact as successfully as possible with the environment. That this approach pays off can be seen from how successful our species is and how diverse life on Earth is.

Nothing is what it seems and nothing seems like what it is.

Primitive information

Information about the environment through awareness is essential for life, but just as essential was the development of capabilities for storing information and passing it on to future generations. Life developed a complex molecule for this: DNA, deoxyribonucleic acid – whose chemical structure, a double helix, was not elucidated until 1953 by James Watson and Francis Crick. Life has a biochemical information storage capacity. DNA contains not only all the information on the development and construction of an organism, but also primitive information that is vital for survival—instincts.

Not only the collection of information, but also its storage and the ability to pass it on are basic requirements for life and consciousness. Primitive information creates a genetic code for how to interpret environmental information.

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