What Are Quantum Waves[1]?

By the no-cloning theorem *we* can't copy quantum states, as reading quantum data alters it forever but *the system* that creates them can. We know that information per se is easy to copy, so if our "its" are literally based on "bits", it is no surprise to find that nature is the ultimate copy machine.

Sharing the load

In quantum realism, any program put on the grid immediately spreads in all directions, like ripples on a pool but in three dimensions not two (Figure). That each node passes it's processing on to its neighbors each cycle gives *Huygens principle* (LINK) that light is a wave where each point is a new wave source. It is a processing wave not a physical wave, so network sharing processing pushes a photon program out at one node per cycle, i.e. the speed of light.

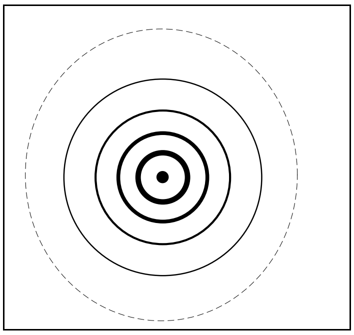

Figure. Pond Ripples

According to Gauss, a pebble dropped in a pool spreads its initial energy out in ripples where the *energy flux* per ripple is constant except for friction. A program spreading instances on a network follows the same law but with no friction. If the *processing flux* per sphere surface is constant, processing will:

1. Combine at any node point,
2. Decrease in power as an inverse square with distance, and,
3. Propagate at one node per local cycle (light speed).

This describes electrical, magnetic and gravitational fields that add by combination[2], decrease as an inverse square of distance and propagate at the speed of light, e.g. if the sun suddenly disappeared it would be eight minutes before it's light stopped arriving on earth.

The nature of distributed processing

A physical wave always involves friction but a processing wave spreads on a network that always runs anyway. So for a Planck program (photon) shared between two nodes, for the first cycle one node sets say the up values and the other the down, and for the next cycle it is reversed. It is like two men sharing a shovel, where in the time one man can dig one hole with one shovel, two men with one shovel can only dig half a hole each. One program running on two nodes runs half as fast on each so in general a *program distributed runs slower not less at each node.* Note, the photon source doesn't run slower as it allocates code to the grid at a constant rate.

In computing, quantum processing involves *instantiation*, an object orientated design technique where screen objects inherit code from a source class. Screen buttons look the same if they run the same code, and every electron may be indistinguishable from every other for the same reason. If a photon program spreads *instances* that share the same source code, each cycle every instruction is allocated to the grid somewhere. The result is a sine wave, because each node must finish the program it starts, however long that takes. As the program begins in one node it finishes in another, so the total processing doesn't change. Indeed the photon program *exists* by running on the grid.

Where is the photon?

To Einstein, a photon was a physical thing located in space with attributes that defined its motion, so it hit a screen at a point based on a linear path from its initial start state. So when quantum theory

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[1] This is section 3.3.4 from Chapter 3 The Light of Existence, of the book Quantum Realism by Brian Whitworth, currently under development. The link gives a free early access to the whole chapter.

[2] If charge 1 has electric field E_1 and charge 2 has electric field E_2 , the electric field at any point $E = E_1 + E_2$

declared that its path to a screen point was randomly decided by the collapse of the wave function *when it arrived*, and the evidence supported this, he argued that there must be "hidden variables":

"This is the fundamental problem: either quantum mechanics is incomplete and needs to be completed by a theory of hidden quantities, or it is complete and then the collapse of the wave function must be made physically plausible. This dilemma has not been solved until today, but on the contrary has become more and more critical."(Audretsch, 2004) p73

Current physics is full of problems like this, that haven't changed in a lifetime. Einstein would feel at home in physics today, as the big issues he addressed haven't changed. In quantum realism, quantum mechanics is neither incomplete nor physically plausible. It isn't incomplete because it works, and it doesn't need physically plausibility because physical realism itself is implausible. Instead, "the photon" is a processing wave whose instances take every possible path to a point. The program then "collapses" to a point, in a restart that is random (to us), based on one instance and the specific path it took.

A physical realist might ask, if a photon is a wave of instances, which one is *the photon*? The question betrays the bias that a photon is a "thing". Certainly photons always *interact* in one place, but that they also travel that way is an assumption tacked on to the facts. In quantum theory photons *interact* at a point but *travel* as probability waves. Its critics couldn't fault this logic because there is no fault. We see physical reality as a set of things, but quantum theory sees it as a set of events. To say an electron *has* wave function is just the stubborn illusion that it is an inherent *thing*. In quantum realism, the electron *is* the quantum wave, and what appears when we observe is a view generated on demand.

Audretsch, J. (2004). *Entangled World: The fascination of quantum information and computation*. Verlag: Wiley.