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Physicists who reject "particle" aspect of QM

For example, the obvious solution to the paradox of the particle / wave duality of matter is to realise that the Wave-Center of the Spherical Standing Wave causes the observed 'particle' effects of Matter (see wave diagram below). Likewise, the discrete 'particle' properties of Light (quanta / photons) are caused by Standing Wave interactions which only occur at discrete frequencies and thus energy states.

I think it is useful to end this quantum physics introduction with two very important quotes. Firstly from Erwin Schrodinger;

What we observe as material bodies and forces are nothing but shapes and variations in the structure of space. Particles are just schaumkommen (appearances). The world is given to me only once, not one existing and one perceived. Subject and object are only one. The barrier between them cannot be said to have broken down as a result of recent experience in the physical sciences, for this barrier does not exist. (Erwin Schrodinger, on Quantum Theory)

Because Schrodinger believed in real waves, he was never happy with Max Born's statistical / probability interpretation of the waves that became commonly accepted (and was actively promoted by Heisenberg and Bohr) in Quantum Theory / Mechanics.

Let me say at the outset, that in this discourse, I am opposing not a few special statements of quantum mechanics / quantum theory held today (1950s), I am opposing as it were the whole of it, I am opposing its basic views that have been shaped 25 years ago, when Max Born put forward his probability interpretation, which was accepted by almost everybody. (Schrödinger E, The Interpretation of Quantum Mechanics. Ox Bow Press, Woodbridge, CN, 1995)

I don't like it, and I'm sorry I ever had anything to do with it. (Erwin Schrodinger talking about quantum theory.)

And I very strongly agree with Schrodinger (and greatly respect him) when he writes;

*The scientist only imposes two things, namely truth and sincerity, imposes them upon himself and upon other scientists. (**Schrodinger**)*

Secondly, David Bohm provides a clear account of how this incorrect 'particle' conception of matter not only causes harm to the Sciences, but also to the way we think and live, and thus to our very society and its future evolution.

The notion that all these fragments is separately existent is evidently an illusion, and this illusion cannot do other than lead to endless conflict and confusion. Indeed, the attempt to live according to the notion that the fragments are really separate is, in essence, what has led to the growing series of extremely urgent crises that is confronting us today. Thus, as is now well known, this way of life has brought about pollution, destruction of the balance of nature, over-population, world-wide economic and political disorder and the creation of an overall environment that is neither physically nor mentally healthy for most of the people who live in it. Individually there has developed a widespread feeling of helplessness and despair, in the face of what seems to be an overwhelming mass of disparate social forces, going beyond the control and even the comprehension of the human beings who are caught up in it.
*(**David Bohm**, Wholeness and the Implicate Order, 1980)*

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de Broglie further explains his reasoning for the particle/wave duality of matter in his 1929 Nobel Prize acceptance speech;

On the one hand the quantum theory of light cannot be considered satisfactory since it defines the energy of a light particle (photon) by the equation E=hf containing the frequency f. Now a purely particle theory contains nothing that enables us to define a frequency; for this reason alone, therefore, we are compelled, in the case of light, to introduce the idea of a particle and that of frequency simultaneously.
*On the other hand, determination of the stable motion of electrons in the atom introduces integers, and up to this point the only phenomena involving integers in physics were those of interference and of normal modes of vibration. This fact suggested to me the idea that electrons too could not be considered simply as particles, but that frequency (wave properties) must be assigned to them also. (**de Broglie**, 1929)*

The solution to their problems was first found by Wolff (1986). He discovered two things (both of which deserve a Nobel prize in their own right);

Firstly, from reading Feynman's PhD thesis (see reference, Feynman and Wheeler, 1945) he was aware of Feynman's conception of charged particles which 'somehow' generated Spherical Electromagnetic In and Out Waves (Feynman called them advanced and retarded waves), but Wolff realised that there are no solutions for spherical vector electromagnetic waves (which are mathematical waves which require both a quantity of force and a direction of force, i.e. vector). Wolff had the foresight to try using real waves, which are Scalar (defined by their Wave-Amplitude only).
And this then led to a series of remarkable discoveries.

He realised that spherical In and Out-Waves removed the need for a separate particle, as the Wave-Center of the Spherical Waves created the particle effect.
He then discovered that when one spherical standing wave was moving relative to another the Doppler shifts gave rise to BOTH the **de Broglie Wavelength** AND the **Mass increase of Albert Einstein's Relativity**. (i.e. Wolff demonstrated that when two charged particles (Wave-Centers of two SSWs) are moving relative to one another they gives rise to beats of interference (caused by the Doppler shifting of the In and Out Waves due to relative Motion) which were identified in experiments as the de Broglie wavelength $y=h/mv$, and also gave rise to the frequency increases and thus energy/mass increases (as $E=hf=mc^2$) of Special Relativity.

As Albert Einstein explains;

How can one assign a discrete succession of energy values E to a system specified in the sense of classical mechanics (the energy function is a given function of the co-ordinates x and the corresponding momenta mv)? Planck's constant h relates the frequency f =E/h to the energy values E. It is therefore sufficient to assign to the system a succession of discrete frequency f values. This reminds us of the fact that in acoustics a series of discrete frequency values is coordinated to a linear partial differential equation (for given boundary conditions) namely the sinusoidal periodic solutions. In corresponding manner, Schrodinger set himself the task of coordinating a partial differential equation for a ***scalar wave*** *function to the*

*given energy function E (x, mv), where the position x and time t are independent variables. (**Albert Einstein**, 1936)*

And here we have a final piece of the puzzle in a sense, for it was Schrodinger who discovered that the **standing waves are scalar waves** rather than vector electromagnetic waves. This is a most important difference. Electromagnetic waves are vector waves - at each point in Space the wave equations yield a vector quantity which describes both a direction and an amplitude (size of force) of the wave, and this relates to the original construction of the e-m field by Faraday which described both a force and a direction of how this force acted on other matter.

Spherical Wave Motions of Space are Scalar waves - at each point in Space the wave equations yield a single quantity which simply describes the wave amplitude (there is no directional component). For example, sound waves are scalar waves where the wave amplitude describes the Motion (or compression) of the wave medium (air). Likewise Space is a nearly rigid Wave-Medium which propagates Wave-Motions.

With **de Broglie's** introduction of the concept of **standing waves** to explain the discrete energy states of atoms and molecules, and the introduction of **scalar waves** by **Schrodinger**, they had intuitively grasped important truths of nature as Albert Einstein confirms;

Experiments on interference made with particle rays have given brilliant proof that the wave character of the phenomena of motion as assumed by the theory does, really, correspond to the facts.
*The de Broglie-Schrodinger method, which has in a certain sense the character of a field theory, does indeed deduce the existence of only discrete states, in surprising agreement with empirical facts. It does so on the basis of differential equations applying a kind of **resonance** argument. (**Albert Einstein**, 1927*

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