

## **A Conceptual Solution of the Wave/Particle Problem in Physics**

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Since all the proven laws of both macro- and microphysics, whether deterministic or probabilistic, and whether Newtonian or relativistic, are true simultaneously, there must be one law that binds them altogether. I propose here to explore this necessity conceptually, without recourse to mathematical formalism. Insight into the nature of physical reality eventually leads to appropriate mathematical expression.

Physics is a sphere. It is deterministic in the middle ground. But, as it approaches the limits of the observable universe, the interactions of the observer with the observed require and result in probabilities. This process of transformation of determinism to probabilism occurs at both macro and micro limits. There is no known limit to the size of the universe, macroscopically considered. There is also no known shape to the physical universe. This latter fact alone implies that there is no known size and points directly back to the limits of both the human organism and its instruments in observing physical reality macroscopically. Likewise, there is no known limit to the smallness of form energy can take and still be observable, though  $h$  or  $h$  bar attempts to put a limit on observability, microscopically. The recent change in value of  $h$  from the National Physical Laboratory, which depended on use of an improved measurement device, shows that this limit, though extremely small, is not absolutely fixed. Again, we encounter interactions between the human organism and its instruments, and the smallest forms of energy/matter. The limits of observability are also not logically equivalent to the limits of physical size. Solution of the wave/particle problem in physics must therefore express oscillation of limits themselves and of observable physical phenomena between macroscopic and microscopic limits.

1. A particle is neither at rest nor in motion when no inertial reference frame (hereafter irf) observation can determine its position or its velocity.
2. A particle is at rest only when the velocity of some irf is taken to be zero and the position of that irf is taken to be fixed relative to any other irf and all observations of the particle are made from that fixed irf.
3. A particle is in motion only when change of its position relative to one irf can be observed from another irf.
4. The motion of a particle is a straight line only when the distance between two successively measured positions is the least possible of all particular observations from the same irf.
5. The velocity of a particle is constant only when regular, successive measurements from the same irf show no difference in time relative to distance among the particle's observed positions.

6. Vibratory frequency is the necessary and sufficient condition for all observations from all irfs.
7. Compressions and expansions of vibratory frequencies determine observable mass and energy.
8. All vibratory frequencies originate from compression and expansion feedback interactions.
9. All compression and expansion feedback interactions originate from the void. The void is the simultaneous copresence of all irfs from which observations can be made. The void is commonly known as space or, in relativistic physics, spacetime. The simultaneous copresence of irfs makes it possible to obtain solutions using various protocols, such as relativistic and nonrelativistic formalisms.
10. Simultaneous copresence of irfs refers not to spatiotemporal relations among vibratory frequencies but to the possibility of choosing any irf as the relatively fixed source of observation.
11. Observation consists of interactions among three types of vibratory frequencies: the observable mass/energy, the inorganic instrument, and the organic perceiver. Interactions among these types set limits on the precision of macroscopic and microscopic solutions. Two groups of solutions are deterministic and probabilistic. Two groups within these groups are exact and approximative.
12. All observables are vibratory frequencies whether they are fields, forces, particles, or waves. The four fundamental forces are all vibratory frequencies, including gravity.
13. Particles and waves are both interference phenomena. They are observable moments of the vibratory structure of the universe. Everything that exists can be understood—described, explained and predicted to some degree of accuracy—as a configuration of waves and particles.
14. However, there is a third term. It is the flux of space itself without which waves and particles, namely, all kinds of existence, are impossible.
15. Velocity and position are both consequences, or functions, of vibratory flux.
16. Charge results from the splitting of the vibration. This is the most fundamental boundary condition of the universe. Splitting creates imbalance in the vibration that appears as opposite charges. Since any state, or phase, of splitting can condense, compress and persist, charged particles form. They are compressions of states of vibrational splitting. Without charge, nothing would exist and nothing would move. All the laws of physics as well as all physical phenomena derive the splitting of the vibration. For example, Newton's first law describes vibrational frequency without interference. Newton's second law describes the result of vibratory frequency compression (mass) with vibratory frequency synergy (acceleration) as vibratory frequency displacement (force). Newton's third law follows from his first two laws, though not vice versa, since the third law describes the reciprocal vibration of compressed frequencies acting upon each other.
17. Quantization also derives from the splitting of the vibration. The non-zero value of the Planck constant results from and expresses the proportionality of energy to the frequency of vibration. The proportionality is constant because both energy

- (E) and frequency ( $\nu$ ) have the same origin. The origin is the splitting of the vibration. Since the splitting is transient, a rhythmic, momentary partition, quantum phenomena display discrete rather than continuous behavior. The wave behavior of the two-slit experiment also derives from the splitting of the vibration. In this case, the transient partitions interfere with one another.
18. The Heisenberg uncertainty principle also derives from the splitting of the vibration because the vibration never completely separates from itself. Thus, position and momentum are always connected both in reality and in measurement through observation. The uncertainty of the principle results from the fact that at any time a measurement is made, whether of position or of momentum, both splitting and joining are occurring simultaneously. At any one time, the vibration of the photon splits between electric and magnetic fields. At any one time, the vibration of the atom splits between positive and negative charges. The result for the conjugate variables must be reciprocal uncertainty for two reasons. First, there is no way to measure the electric or the magnetic component of the wavefront separately in its interaction with the atom. Second, any measurement of either position or momentum, after the first measurement, requires another photon which again displaces the atom. Because the photon is the means of measurement, it can never separate itself from the interaction with the atom to create a new inertial reference frame from which the results of the impact can be measured with arbitrary precision.
  19. Vibration occurs in twelve dimensions. A dimension is a form of energy constituting an inertial reference frame whose signal may not be detectable from another dimension without some kind of transformation of energy from one form to another, that is, from one dimension to another. Electromagnetism, including radiation that is visible or invisible to the human eye and its instrumental extensions, is a signal system appropriate for one dimension of energy. Energy traveling at speeds greater than or lesser than light, and signal systems that do not use emr, may be necessary for communication between and among other dimensions.
  20. Positive and negative charges, energy and matter, four fundamental forces, spacetime, anti-matter and neutral charge are all consequences of multiple, simultaneous vibrational splitting. Vibrational splitting can, does and is occurring in all twelve dimensions simultaneously. One mathematical expression of multiple, simultaneous dimensional splitting is the non-linearity of the field equations of general relativity. A second example is the Mandelbrot set. A third is Feigenbaum's number. A final example is bifurcation in the deterministic chaos of dissipative systems.
  21. All dissipative systems are transients in and of the flux. The flux is not a transient in and of anything. It is multi-dimensional and self-regenerating. All conservation laws and phenomena derive from and are consequences of the self-regeneration of the flux. Although space is not a fluid, still multiple, simultaneous vibration of the flux can be analogized with water. A single water molecule can vibrate in six different dynamic configurations; thus, large numbers of water molecules vibrating both proximately and simultaneously in one of those

configurations synergize the various qualities of observable water, both its droplets and its waves.