General Requirements of Set Theory

It must relate *directly* to our chosen logical system and truth-valuations.

It must 'bridge the gap' between our logical system and the rest of math in a *coherent* fashion.

It must be *extremely precise*.

It needs to define what sets *are*, identify any *special* sets, and ideally, what are *not* sets.

It needs to 'set the stage' so that *useful and meaningful* theorems can be developed for item two.

Everything developed must be *consistent*.

Ideally, the system should be *economical* in the sense of expressing truths and proving them in some relatively minimal form.

Perhaps most importantly, it should jive with and reinforce our *correct intuitions* about sets.

General Requirements of any Quantum Mechanics

It must relate *directly* to our chosen logical system and truth-valuations.

Explain the idiosyncratic behavior of quantum systems in a *concise and coherent* fashion.

'Bridge the gap' between 'nothing' and macroscopic systems in a *coherent* fashion.

Be *extremely precise*.

Define what quantum systems *are*, identify any *special* quantum systems, and ideally, what are *not* quantum systems.

'Set the stage' so that *macroscopic manifestations* of quantum states are completely understood/predicted.

Everything developed must be *consistent*.

Ideally, the theory should be *economical* in the sense of expressing truths and proving them in some relatively minimal form.

Perhaps most importantly, it should jive with and reinforce our *correct intuitions* about quantum systems.

Finally, any QM theory developed should jive with *general relativity*.

Axioms of Quantum Realism

Axiom 0: Spacetime Characteristics: Space is globally flat, smooth, continuous, finite, and possesses *characteristic impedance*; time is globally flat, unidirectional, smooth, continuous, and *elastic*.

Axiom 1: Local Time: Time is *locally distorted* (slowed down) due to local energy density and kinetic energy – relative to an absolute cosmological frame.

Axiom 2: Mass: Elementary particles: protons, electrons, photons, and their antiparticle versions are charged/uncharged 3D *wavelets of temporal curvature*.

Axiom 3: Types of Mass: Particles have *positive* temporal curvature; antiparticles have *negative* temporal curvature; near the surface of a particle, time slows down; near the surface of an antiparticle, time speeds up (both relative to flat-time).

Axiom 4: Gravitation: Because of Axiom 3, *particles aggregate* globally (gravitationally); *antiparticles do not*.

Axiom 5: Electromagnetism: Charged antiphotons *mediate electromagnetism*.

Axiom 6: Conservation: Temporal curvature is a *conserved quantity* under pair creation/annihilation: particle-antiparticle mutual annihilation produces a photon-antiphoton pair; an energetic photon entering a strong magnetic field mutually annihilates with one of the antiphotons comprising the magnetic field creating a *balanced curvature* pair.

Axiom 7: Energy: There are *only three* forms of energy: particulate, relative kinetic, and photons; there is no 'Holy Grail' of energy production.

Axiom 8: Nuclear Stability: Not all possible nuclear configurations are stable, most are not, some have allowable metastable states, most do not,.. If all nuclear configurations were stable, all mass would be locked into nuclei and life could not exist. A prerequisite for life is nuclear *instability*. Then, there must be *sufficient stable nuclei* to create the building blocks of life. These depend on three things: the *shape* of protons and neutrons, the *nature* of their boundaries (from Axiom 2), and allowable assemblages (geometric placement of protons). Rotational and vibrational modes must also be considered.

Axiom 9: The Hydrogen Atom: Perhaps the simplest quantum *system* is a hydrogen atom. It is the most abundant element. It is *the* prerequisite for stellar furnaces. It's a prerequisite for life. There are *three distinct prerequisites* for hydrogen: the first is their *opposite charge,* the next is the property of *quantum spin*, and perhaps least critical is the *mass asymmetry* between protons and electrons.

Axiom 10: Carbon, Oxygen, and Iron: Continuing Axiom 8, certain elements are *critical* to life. Life cannot exist with any 'substitute' elements. Without these three, life cannot occur. Some readers might inquire: why iron? Stars need a 'stopping point' for nuclear reactions: the point where energy is not produced by fusion nor fission: the most stable isotope. Once stars reach this stage in nuclear reactions, they nova – spreading life-prerequisites locally.

Axiom 11: Allowable Orbitals: s, p, d, f indicate the geometry of particular atomic orbitals. Too many, life could not exist; too few, life could not exist. Life requires a limited, specific configuration, set of

atomic orbitals.

Axiom 12: Parameter Ratios: A few 'global' parameter ratios define the possibility of life. For instance, if G/α is too big, massive stars dominate and life never happens. If it's too small, electromagnetism dominates and stars never form. Some parameter ratios are absolute prerequisites for life. G, in this scheme, relates to the 'far field residue' of particulate temporal curvature. α relates to the antiphoton flux present in any epoch. So it is possible that α varies over epochs depending on global antiphoton flux.

So, do these Axioms require us to *totally revise* physics? No. Much of chemistry and physics have been established before I was born. Orbital theory, atomic and nuclear structure – these are not necessarily inherently random entities.. All the theories attempting to explain or calculate specific configurations are not necessarily based on random variables. So there's room for determinism within the current paradigm. Axioms 0 through 6, parts of 8, and the implied basis of 12 need to be investigated thoroughly. The core Axioms are 0 through 3 with the primary being Axiom 2.

I have at least one suggestion about investigating this. It does not validate the *wavelet* nature of elementary particles; it investigates the assumed *dynamical nature* of them. Let's use the analogy of two pool balls colliding. They're hard, they're rigid, and they bounce. If we put sensors on two colliding pool balls, we'd be able to measure the acoustic reverberations within each – if our sampling rate and sensitivity were great enough. We'd have to delete the noise caused by rolling on the felt surface, but I'm confident we could detect acoustic waves within each ball. If the noise from the surface was too great – swamping the acoustic reverberations, we could attempt to measure pendulums clacking into each other. It's an interesting experiment in the macroscopic realm.. How could we translate this experiment to the *microscopic* realm? Two protons colliding inelastically would be the analogy. The obvious problem is: we cannot attach sensors to proton surfaces! We need to be clever about how to measure any 'reverberations' within protons after a significant collision. I'm guessing, but perhaps we could measure some form of transient excitation within a proton by observing its *fusion potential* just afterwards. It's an interesting idea, but perhaps I'm considering the wrong parameters. In any case, getting a post-bounced proton to fuse with another seems dubious.. There must be some 'ideal gas' (or perhaps plasma state) consequences of internal vibration. A gas molecule is a quantum *system* and is *qualitatively different* from a single proton. So I'm not confident we can generalize quantum *system* behavior toward a *singlet* state.. As a theoretical consideration, how would a proton dissipate internal acoustic energy anyways? Perhaps it can't. It's a decent theoretical question.. As always, we find we generate many more questions than we ask. It's the nature of fertile ground.