Structure in Reality

By J.A.J. van Leunen

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Abstract

Study of the physical reality can happen in two different ways that meet each other at a certain point and then complement each other.

1 Introduction

The name physical reality is used to display the universe with everything that exists and moves therein. It does not matter whether the aspects of this reality are observable. It is even plausible that a large part of this reality is not in any way perceptible. The part that is observable, at the same time, shows an enormous complexity, and yet it demonstrates a peculiarly large coherence. Physical reality clearly has a structure. Moreover, this structure has a hierarchy. Higher layers are becoming more complicated. That means immediately that a dive into the deeper layers reveals an increasingly simpler structure. Eventually, we come to the foundation, and that structure must be easily understandable. The way back to higher structure layers delivers an interesting incident. The foundation must force the development of reality in a predetermined direction. The evolution of reality resembles the evolution of a seed from which a specific plant can grow. The growth process provides restrictions so that only this type of plant can develop. This similarity, therefore, means that the fundamentals of physical reality can only develop the reality that we know.

2 Two approaches

This philosophy means that the development of physics can occur in two ways.

2.1 Conventional physics

The first, already long in use mode uses the interpretation of perceptions of the behavior and the structure of the reality. This method provides descriptions that in practice are very useful. This fact is especially true if mathematical structures and formulas can capture the structure and the behavior. In that case, the result fits the description to not yet encountered situations. This effect has made the field of applied physics very successful. However, the method does not provide reliable explanations for the origins of the discovered structure and the discovered behavior. This situation gives rise to guesswork, that gambles for the discovery of a usable origin. So far, these efforts have not proved very fruitful.

2.2 From the ground up

The other way suggests the existence of a potential candidate for the foundation of physical reality. The method supposes that this foundation has such a simple structure that intelligent people have already added this structure as an interesting structure to the list of discovered structures. For them, there existed no need to seek the foundation of reality. We can assume that mathematics already includes the foundation of the structure of reality without this structure bearing the hallmark "Foundation of Reality." However, this structure will carry the property, which says that this simple structure automatically passes into a more complicated structure, which in turn also emerges into a more complicated structure. After some evolutionary steps, it should become apparent that the successors of the initial structure increasingly contain the properties and support the behavior of the observed reality. In other words, the two approaches will move towards each other.

2.3 Framework

The quest for a suitable candidate seems almost impossible, but we are lucky. About eighty years ago, two scholars discovered a mathematical structure that seems to meet the conditions. It happened in a turbulent time when everyone was still looking for an explanation for the behavior of tiny objects. One of the two scholars, John Von Neumann, searched for a framework in which scientists can model quantum mechanics. The other scholar, Garrett Birkhoff, was a specialist in relational structures, which the mathematicians called lattices. Together they introduced the orthomodular lattice, and they decided to name this structure quantum logic. They chose this name because the structure of the already known classical logic closely resembles the newly discovered quantum logic. This choice was an unfortunate naming because the discovered structure proves to be no logical system at all. In the document, in which the duo introduced their discovery, they proved that a recently by David Hilbert discovered structure contains an orthomodular lattice as part of its structure. The discovery of David Hilbert is a vector space that can have a countable number of dimensions. Scientists called this new structure a Hilbert space. The elements of the orthomodular lattice correspond to the subspaces of the vector space. They are certainly not logical statements. Together they span the whole Hilbert space. The Hilbert space has as an additional feature that the internal product of two vectors produces a number that can be used to form linear combinations of vectors that become part of the vector space. In the number system that fits, must any number that is not equal to zero own a unique inverse. There are only three number systems that meet this requirement. These are the real numbers, the complex numbers, and the quaternions. This requirement immediately imposes a firm restriction on extending the orthomodular lattice to a more complex structure. This kind of constraint is what we seek when the foundation evolves to a higher level.

Mechanisms that map a Hilbert space onto itself are called operators. If the operator maps a normalized vector along itself, then the inner vector product of the vector pair produces an associated eigenvalue. The vector in question is the corresponding eigenvector. Quaternions prove to be an excellent repository for the combination of a time stamp and a three-dimensional location. The by Hilbert discovered structure proves to be a very flexible repository for dynamic geometric data of point-shaped objects. The operators are the administrators of these storage bins.

The extension to the Hilbert space is only a first step. Quaternionic number systems exist in many versions that differ in the way that Cartesian and polar coordinate systems can organize these number systems. This fact means that in a single underlying vector space a whole range of Hilbert spaces can be applied, with the corresponding versions of the number systems floating over each other. Each Hilbert space has a parameter space with its own set of coordinates systems. The version of the number system fills the parameter space with its numbers. A reference operator manages the parameter space.

By using the parameter space and a quaternionic function, the model can define a new operator. This new operator uses the eigenvectors of the reference operator and utilizes the function values as the corresponding eigenvalues. This procedure connects the operator technology of the Hilbert space to the quaternionic function theory. This base model is a powerful tool to model quantum systems.

One of the platforms acts as a background and thus provides the background parameter space.

It is possible to choose a real progression value and connect this value to the subspace corresponding to the background reference operator's eigenvectors whose real part of the eigenvalue corresponds to this progression value. The chosen progression value now divides the model into a historical part and a future part. The separated subspace represents the current status quo of the model. This result means that ordering the real parts of the eigenvalues of operators creates a dynamic model.

The Hilbert spaces, which have a countable dimension, support only operators with a countable eigenspace. These eigenspaces can only contain sets of rational eigenvalues. Each infinite dimensional countable Hilbert space possesses a unique non-countable companion Hilbert space that embeds his countable partner. The non-countable Hilbert space contains operators that possess eigenspaces which are not countable. These eigenspaces form continuums and are mathematically synonymous with fields. Quaternionic functions can describe these fields and continuums. The parameter spaces of these functions are flat continuums.

This structure is starting to become quite complicated but still contains very little dynamism. Only platforms that can float over each other form the so far conceived dynamic objects.

3 Meeting

There are already agreements with the structure that conventional physics has discovered. The base model acts as a storage space for dynamic geometric data. Dynamics can occur if this storage space contains data that after sorting the timestamps tells a dynamic story. The model then tells the tale of a creator that at the time of creation fills the countable Hilbert spaces with dynamic geometric properties of his creatures. After the creation, the creator leaves his creatures alone.

Conventional physics has discovered elementary particles. In fact, they are elementary modules because together they compile all the modules that occur in the universe and some modules form modular systems. The elementary modules appear to live on the floating platforms. They inherit the properties of their platform. The symmetry of the platform determines the intrinsic properties of the platform. At each new progression instant, the elementary particle gets a new location. How this exactly happens is not immediately clear, but the findings of conventional physics give a clue. The elementary particle possesses a wavefunction, which suggests that a stochastic process generates the locations. If this is true, then the elementary particle hops through a hopping path, and after some time, the landing locations form a landing location swarm. This swarm possesses a location density distribution, which is equal to the square of the modulus of the wavefunction. The elementary particle is thus represented by a private platform, by a stochastic process, by a hopping path, by a dense and coherent landing location swarm and by its wavefunction.

As for the elementary particles, the two approaches, therefore, match well. Apart from that, the quaternionic differential theory proves to deliver a great agreement with the equations that Maxwell and others found through interpretations of the results of experiments. The quaternionic differential calculus explains in deep detail how the fields respond to point-like artifacts. The artifacts are the hop landing locations. The field responds with a spherical shock front, which then integrates into a small volume. Mathematicians call the shape of this volume the Green's function of the field. Due to the dynamics of the shock front, the plop spreads all over the field. In summary, each hop landing causes a small deformation that quickly fades away. The hop landing also expands the volume of the field a little bit. The plops partly overlap each other in space and in time. This story explains why the elementary particle constantly deforms its living space and why the particle possesses a quantity of mass. At the same time, the story explains the origin of gravitation and makes clear that the hop landings expand the universe. The Green's function blurs the location density distribution, and the result equals the contribution of the elementary particle to the local gravitation potential.

It appears that both approaches can complement or correct each other.

Observations and measurements cannot uncover everything. Only the application of deduction can expose the parts of the physical reality that resist observation. The interplay of measurements and deduction can bring about the necessary confidence. The requirement that experiments must verify everything is sound-ready crap. Much of the physical reality is inaccessible to measurement. In that case, deduction remains the only way of approach.

The Hilbert Book Model Project [1] explores the mathematical foundation of physical reality. An e-print archive [2] contains documents that highlight certain aspects of this project.

References

[1] https://en.wikiversity.org/wiki/Hilbert_Book_Model_Project

[2] http://vixra.org/author/j_a_j_van_leunen