

# Limits of human knowledge

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## 1 Introduction

Humans have limited ability to comprehend the universe. Our knowledge is neatly divided into separate and independent disciplines. Our survival depends on a generalist approach. Our experience in the macroscopic world serves as a base for expanding our knowledge. Our environment is continually changing. Eventually the Earth itself will die. Maintaining status quo is not an option.

Understanding is the ability to predict events and observations. Wisdom is the ability to cause events and observations (Hodge 2012). Humanity has discovered that greater Understanding and greater Wisdom yields survival and population growth.

Humanity lacks the Wisdom to create a universe. But it has the Understanding to predict some events. The Wisdom humanity has is a smaller subset of Understanding that is a small sunset of ontology. Thinking any of humanity's Understanding reflects ontology of the universe is hubris.

Human Understanding devoted to expanding our survivability can be divided into two general categories: religious and scientific. Each has developed methods and criteria to advance human Understanding. Each works by recognizing patterns in the universe and by passing tests of survival.

Human modeling starts from postulates, which include methods of reasoning (logic), and extends to theorems. Survival for a longer time requires the amount of useful information and models to be expanded. Humans have developed models of how the universe works to serve the required expansion.

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“More fundamental” means the models humans need to explain the complexity of the entire universe (most general) could be simpler and more useful at the expense of an increased need for synthesis. This is Occam’s razor applied to the human understanding of the universe. The synthesis of emergent models replaces the analysis of reductionism. The rules for synthesis must also be more universal.

Religious Understanding predominantly concerns human social and human organizing. The time span of improvement is centuries. The universe (nature) tends to work by rejecting competing systems (Carroll 2016) as does physics. Because of the time required to determine rejection, the religious method of logic is “trial-and-error”. Typical moral thinking seems to lack mathematics, but statistics can model the characteristics of human development and suggest human organization theories. However, these theories are not yet at the Wisdom state of Understanding. The observation of several existing moral systems suggests humanity has much to learn.

Scientific Wisdom is concerned with the physical effects in the universe. Mathematics can “prove” the theorems by being self-consistent with its own postulates. Physical sciences must be consistent with observations that are the result of the largely unknown ontological workings of the universe. Therefore, physics can only reject arguments from the postulates. If the logic and the measurements are valid, then adjusting the postulates attains an increase in Wisdom.

The necessary paradigm shift in the fundamental models is long overdue. Within models that have some Understanding there exists factors that inhibits Wisdom. These factors are Uncomputability, Undecidability, and Unpredictability. The challenge is to determine the limiting factors and then to create new models or new equipment to reduce factors. The general assumptions above suggest physics must incorporate these factors or accept limitations.

This essay considers current knowledge concepts. Religious concepts are part of life and society. The next Theory of Everything model is considered to be a unification of principles for cosmology and the quantum world. The Scalar Theory of Everything model (STOE) suggests the same set of principles should include life and society observations. The STOE demonstrates the type of postulate changes required. Uncomputability and Undecidability are discussed in Section 2, unpredictability is discussed in Section 3, and emergence is discussed Section 4. The conclusion is in Section 5.

## 2 Uncomputability and Undecidability

Humanity has created mathematical methods of the universe that aid Understanding and Wisdom. If mathematics is a core characteristic of our universe, the success of mathematics helping humanity suggests that a high degree of rationalism is fundamental. Mathematics rejects the idea of duality.

Mathematics has two varieties, algebraic and geometric. Algebraic deals with numbers that are counts of discrete things. Physics adds the standard of measure as the thing counted. Special functions of mathematics may be abstract so that the count is unrelated to measures and, therefore, unrelated to physical processes in the universe. Geometric mathematics deals with continuous shapes.

“Computability” refers to the ability to calculate values or shapes of mathematical descriptions to form other values or shapes. “Decidability” refers to the ability to decide the value or shapes of objects. When describing physical events or entities in the universe, the computation must yield some other observed value or shape in the universe, which may be in the future. Physics models create algorithms. That is, algorithms are cause–effect models of universe processes. An algorithm that yields an unobserved outcome or fails to yield an outcome (addressed by Turing as “uncomputable” and by Gödel as undecidable) is non–physical. The universe does produce outcomes over time. If a model suggests the outcome should be observed and it’s not, then the algorithm is incorrect for the model or the model is incorrect. That is, an algorithm representing the physics of a universe process must be computable and decidable.

But mathematics and physics currently have limited ability to describe and predict events. Concepts outside those limits are considered with vague and poorly defined concepts. Consciousness, aims, and intentions are such concepts. Without a scientific definition, the discussion must be vague, subject to many interpretations, and, therefore, useless. Perhaps a new math may describe consciousness and brain functioning.

The STOE suggests a Universal Equation that calculates the force exerted at every point is a function of all galaxies and all mass in the universe (Hodge 2018b). However, the long–term average temperature of galaxy clusters hunts the same value for all clusters. Therefore, perhaps only a galaxy cluster need be considered (Hodge 2006b). The STOE concept serves to calculate the asymmetry of rotation curves (Hodge 2006c) and the discrete (periodic) redshift measurements (Hodge 2006a) that mystify other models.

Human physics computability is limited by the degree of accuracy of a measurement. However, the universe has no such limitation. Another limitation results from having incorrect assumptions about the functioning of the universe and about the initial conditions of a modeled process. Mathematics starts with human assumptions, not physical assumptions.

The operation of division is used in mathematics but is disallowed in the universe. For example, a line is the extension of a point in space. A line defined as an infinite number of points is not physical. That is, irrational numbers such as  $1/3$  and a result of infinity such as division by zero are not points of a line. The key is that division introduces an uncertainty in a human calculation similar to a measurement uncertainty.

Transformation equations introduce fictitious parameters to aid the calculation. They are subject to all the potential problems of mathematics such as division by zero. The General Relativity (GR) field equation is such an equation. The introduced parameters are unreal. They must be re-converted to measurable parameters.

The STOE suggests the physical universe uses only cardinal numbers with zero and excludes negative numbers for physical values. For example, the particle and antiparticle behavior is due to differing structures (Hodge 2016a). The structure determines the type of vortices they cause. These vortices annihilate upon joining (+ and -) (Hodge 2018a). This model has the additional advantage that the less probable structures are less numerous in the universe.

The ordering of universe physical conditions (ordinal numbers) derives from the measurements. That is, a single step (+1) of the ordinal number may have varying measurement values and is non-physical. Therefore, the range of natural numbers is non-physical and confined to mathematics.

The STOE suggests one of the most fundamental components of the universe is physically continuous (Hodge 2014b). Natural numbers may represent the continuous component such as  $\pi$  and such as transcendental functions only to an uncertainty level. The waves in the continuous component and the Universal Equation maintain the geometric lengths of distance without the division required by the algebraic calculation.

Other mathematical concepts of imaginary numbers, more than three spatial dimensions, and transforms should be viewed with skepticism. If a model calculation yields an unobserved value, then suspect the mathematics model process in addition to suspecting the assumptions. But, these mathematical concepts are mere band-aids to cover a need for a better physical model of

initial conditions and processes. The STOE is an example of how this may be done.

Therefore, Gödel's and Turing's proofs are inapplicable to the computability and decidability of physical events. Until humanity can create a universe, the inaccuracies of human physical models continue.

The synthesis of mathematics with physical observation has resulted in greater and more accurate predictability. The end goal is survival through usefulness.

### 3 Unpredictability

Certain concepts have aided humanity develop greater Wisdom. The determinism of events and observations should be assumed even if the ontology of the universe is not deterministic. Therefore, cause-and-effect is assumed for all observations where effects are not assumed. Models are the suggestions of patterns of cause-and-effect. Yet, all models must have some assumed effects without causes. All other observations are then to be derived by the model. Because of human limitations, the better model has a minimum of uncaused effects while deriving all observations. For example, part of the unifying of cosmology observations and observation of the small should be the unifying of the uncaused effects. The STOE plenum is like the "space" of GR and the medium supporting wave action of QM. These are not anthropic type principles. Without determinism and cause-and-effect humanity would be unable to increase Wisdom.

However, even if the universe were ontologically deterministic, the assumptions made about the initial conditions would have to allow some undetermined cause. Therefore, the universe is ultimately unpredictable. So, the best that humanity could do is predict to a limited amount of time and a limited amount of space. Humanities quest for Wisdom is to expand these limits.

The use of statistical mathematics may be used when Understanding of a physical model is inadequate. When the causes of disease were unknown, statistics help Understand and Predict likely outbreaks and correlations. The correlation with polluted water helped reduce cholera although a physical cause was unknown.

Quantum mechanics (QM) uses a statistical approach. Some interpretations of QM suggest a physical reality. However, some of these interpretations

result in many weird propositions. The STOE suggests that the universe is self-similar. Therefore, the equations and physical reality of the Newtonian scale apply to the very small scale. The core of QM rests on the explanations of light. The interference experiments seem contradictory to particle experiments such as the photoelectric experiment. The STOE follows the Newtonian model of light (Newton 1730, queries 17, 18, 19, 20, and 21). The Bohm Interpretation suggests particles have a definite position and momentum and the statistics results from an imprecise measurement. The Transactional Interpretation (TIQM) posits a wave returning from the future. The STOE suggest the “future” wave is a real wave that travels much faster than light and that reflects from objects ahead of the photon. Thus, quantum eraser and entanglement experiments can be explained.

The model of a photon as a structure (Hodge 2016a) also suggests the light emitted from atoms suggests the atomic structure is rigid photons not electrons in orbits(Hodge 2019b). This model avoids many conceptual problems such as the lack of the decay of orbits without emission and the many ad hoc “selection rules”.

## 4 Emergence

Emergent agents and their simple rules of behavior form more complex entities and behaviors (Hodge 2016c). Two is a very fundamental form of organization. The STOE suggests there are two fundamental, physical components (hods and plenum) with their Spirit (interaction) and two major structures (sources/spiral galaxies and sinks/elliptical galaxies) of the universe (Hodge 2014b). The STOE Universal Equation is not a mathematical transformation because both sides of the equation are posited to be real physical entities. The hod/plenum model is the only model to predict and describe the Hodge diffraction experiments that rejects all wave model of light (Hodge 2014c, 2019c).

The relation between the agents and the emerged entities is causal. Therefore, because a single universe exists, a single Theory of Everything exists involving causal relations from the very small to the very large and involving the cause of society’s success and life’ consciousness. Additional concepts such as fractal structures and negative feedback loops from the emergent principal that describe the universe are also helpful.

For example, life’s principle of the survival-of-the-fittest could be applied

to particles where only the structures of the long-lived particles (photon, electron neutrino, and electron) are key. The Serengeti rules (Carroll 2016) suggest feedback rules reject the weak rather than support the stronger. Likewise the CMB's feedback forms the temperature of the universe (Hodge 2006b). So, the stable agents at a given level of emergence are allowed to form diverse structures with their spirit. The unstable are rejected. The remainders are merely temporary as they form into more stable structures.

Combinations of simpler structures form more complex life. Human embryos go through the stages of evolution. State societies are composed of families, tribes, and chiefdoms. Likewise, electrons and neutrons are composed of photons. The analogy of one fractal scale to another is the ancient Chinese "Proof by Analogy".

Life has found the division of labor/energy/force into two sexes provides survival for more complex life forms. Darwin is credited with making a great stride in Understanding about life without an understanding in mathematics (Livio 2013). But Darwin had problems in how traits are passed to the next generation. Perhaps because of the lack of mathematics, it remained for Mendel to introduce genetics models into life process models. Gregor Mendel may have been thinking of sex division by two when he designed his experiments to look for two (dominant v. recessive) traits (Bronowski 1973). The sex of a child is not averaged. Cells divide by two. There are two strands of DNA. How the life functions are divided varies among species. The division of nurturing and provide/protect seems to allow humans a more complex structure (Hodge 2012). Boolean mathematics has allowed the construction of computers where base-three arithmetic failed. Societies must still survive natural internal collapse tendencies (Glubb 1977; Tainter 1990).

The life and society structures are thermodynamically open systems. Consequently, the universe is not adiabatic and is an open system with Sources and Sinks (Hodge 2014b).

Conversely, if a principle appears simpler for the data in physics but fails in life and society observations, then the principle is false. The fundamental principle is Nature's rules must be obeyed.

## 5 Conclusion

Humanity currently requires a paradigm shift in models of physics, life, and society. The amount of unexplained observational data is huge. More funda-

mental descriptions are simpler, more useful, and apply to the entire universe including areas of mathematics, physical sciences, life, and society. The uncomputability, undecidability, and unpredictability of the models limits human wisdom. Because the universe does yield definite characteristics and decisions, the STOE suggests the Gödel's incompleteness theorems, Turing's proof of non-computability, and other similar mathematical proofs do not apply to physics. Indeed, "proofing" cannot be part of the physical sciences. The apparent uncomputability and undecidability problems of human understanding are a result of human limitations. Unphysical mathematical concepts are mere band-aids to cover a need for a better physical model of initial conditions and processes. The STOE is an example of how this may be done. However, because the universe's source of initial conditions is unknowable, the universe is unpredictable except for limited space and time.

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