

## The End of Questions

By Jeff Schmitz

Abstract: A meta-math function will define and help to find the fundamental nature of the universe. The problem is the meta-math function is the scientific method and the fundamental element is not easy to find and might not be that important in the end.

The speed of light in a vacuum is  $c = 2.998 \times 10^8$  m/s.

At one point in history it was thought that speed of light was infinite, but light does have a finite speed. There is no known reason why the speed of light is this speed and not a little faster or slower. One way of defining "fundamental" is as something that is not dependent on anything else, which would make the speed of light fundamental. If the speed of light were found to be dependent on other constants then it would no longer be considered fundamental. There are several known constants such as Boltzmann constant, gravitational constant and others. Centuries ago the number seven seemed a possible key to the understanding of the universe because of the seven planets, the seven colors in a rainbow and the seven notes in the musical scale, with each planet having its own note and color. The number seven showed that there was some plan to the universe and other things were placed in list of seven, seven sins and seven seas, as examples, to fit with the universe. We now know that there are more than seven planets, we have a twelve note scale and the electro-magnetic spectrum extends from beyond the colors we can see, but this shows the desire to find a pattern and meaning to the universe. The idea that the universe based on some number or geometric relationships seems to be appealing. There is not a whole number days in a lunar month and not a whole number of lunar months in a year, yet throughout history there has been a search to fit these values into some complex system and a few of failed systems are beautiful and creative. We now know that the Earth's rotational period and the Moon's orbital period have slowly been increasing during Earth's over 4 billion year history, so the values that felt to be important are arbitrary and impermanent. The values of the currently known physical constants have been used to form complex systems that might remind one of the perfect calendar systems. No wonder that in the science fiction spoof "A hitch hiker's guide to the galaxy" author Douglas Adams had "42" as the answer to the universe. The fundamental might be a random number, but this does not mean that fundamental is a random number and that we should spend our time looking for that number.

There was a debate if mathematics needed a few arbitrary rules to set up or if mathematics was a self-generated system that was discovered instead of created. If mathematics were self-generating then it would be fundamental and might be the basis of the universe. The mathematician Gödel stated the incompleteness theorem that addressed this point:

The proof of a system cannot be a part of that system.

Because the above statement refers to all proofs of all systems, a proof of the statement would contradict itself, since the statement is a system.

This means there is no self-generated mathematical system that by itself can define the universe. Gödel's incompleteness theorem has been called meta-math because the rigor of mathematics was used to prove that this theorem cannot be proved and is therefore just outside of mathematics. The function to produce a true random number would be a meta-math function since any function will produce a repeatable pattern therefore a true random number could not be produced by a mathematical function. A meta-math function is defined by what it is not, and in the same way "fundamental" is defined by what it is not.

The scientific method is a meta-math function since something outside of mathematics: observation and experiment is required, yet the structure of mathematics is also required. The scientific method is what makes a study a science and therefore the fundamental element of the discipline. The scientific method does not prove a hypothesis is true, but can only determine if something is false. The more a hypothesis or theory is tested the more certain we can be of its "truth", but absolute certainty will never be found by science.

Biology is a science with a fundamental principle, evolution, yet our understanding of this topic is far from complete. A biologist is no longer someone who just categorizes life, but is now someone who reverse engineers evolution. The scientific method would be considered more fundamental than evolution because science discovered evolution, but the scientific method and evolution are really the same process. Every organism that has lived (or is living) on this planet was (or is) an experiment and the product of past experiments. The genetic code could be thought of as number of a bio-chemical function that is one of the solutions to the problem of survival.

If one were looking for the key to the universe, the scientific method might seem a poor choice, because science seems a human construct, but like all meta-math functions science is defined by what it is not; Science is not bias and will slowly take the human perspective away. Another issue is looking to science for understanding, because science mostly gives us solutions and more questions, not true answers. A fundamental will be just beyond science. The fundamental basis of things does not have answers, but is beyond science's ability to generate questions. A fundamental just is without question. Using the speed of light as an example, the speed of light in a material can be slower, but never faster than the speed of light in a vacuum ( $c$ ). If light was found to go faster in some material than  $c$  or a particle that could travel faster than " $c$ " was found than " $c$ " would no longer be a fundamental and all we think we know about Physics would change and questions would be generated. The experiment that found the violation of the constant would become more fundamental than the constant. The lack of a confirmed faster than " $c$ " event keeps " $c$ " as the fundamental " $c$ ".

The opinion of the author is that current science is far from finding the fundamental nature of the universe. This would lead one to think that this essay is against the search for this fundamental thing, but the opposite is true. The disproof of a proposed fundamental is possible with experimental science and the bigger and the more all encompassing the better because there are more experiments possible.

String theory might be a victim of small thinking; if string theory included gravity, chemistry, biology and cake baking there would be something to test. Most of the experiments that are the basis for quantum mechanics are electrons interacting with electromagnetic waves. The idea that all particles have associated waves and all waves have particles is mostly from these interactions. Currently science is able to just barely detect the strongest gravity waves and just barely detect neutrinos, which might be the most common particle in the universe. We assume the rules of quantum mechanics apply to gravity waves and neutrinos, but we have no experiment evidence for this assumption. This just shows that the fundamentals of Physics might be in doubt, but the questions, which are needed to drive science, are in good supply. In science the journey is what is important, our incomplete understanding of the universe has given us our current science, medicine and technology. Past attempts understand the true fundamental nature of the universe have resulted in strange and sometimes humorous hypotheses, but still produced advancements in science. The true fundamental of the universe might be a random number, a function or a type of thing we do not yet have a name and method to understand. Perhaps that true fundamental, that end of questions, is only of value as an inspiration.

## References:

Self references: I do not like self references because they make me seem like I am talking to myself, but many of these topics I covered in my FQXI essays – Billy Pilgrim Blues, The Smell of the Moon and Robots, Supply and Demand.

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