Truth within the Limits of Knowledge

Version: 1.0.1.1
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ISBN: 978-0-9810242-9-5,

This work is an explicit study into what truth is. It demonstrates that knowledge is dependent on the number of *unknowns* irrespective of what is believed to be *true*, which would have grave implications on all scientific truths as there are many remaining *unknowns*. It demonstrates all *truths* are based on prior *truths* and *unknowns* hierarchically, no *truth* is silo onto itself, that all *truths* and *falsehoods* are time based, and that all *truths* are prescribed based on boundary conditions within probability to allow this reality to be manageable.

In reality, we understand there to be *truths* (T), *falsehoods* (F) and *unknowns* (U):

$$\begin{aligned} T &= -F \\ F &= -T \\ U &= T \vee F = T \end{aligned} \tag{1}$$

Notice that U (*unknown*) can be either a *truth* or *falsehood*, in which case the *unknown* is a *truth* especially in product with another *truth*. It can also be stated that knowing a *falsehood* exists is a *truth* itself. Given this, all *truths* are based on prior *truths*. For example, the statement that "cars exist in Canada" or "*p* in *b*" where *p*="cars exist" and *b*="Canada" is based on prior *truths* that "cars" exist and that "Canada" exists. We can also state that "no unicorns exist in Canada" or "no *p* in *b*" where *p*="unicorns exist" is a *falsehood*, but is augmented by the prefixing word "no" to make it a *truth* that "no unicorns exist". With this understanding, we can explicitly state the probability of this truth as:

$$\begin{aligned} P(p) &= 1 \\ P(b) &= 1 \\ P(p \cdot b) &= P(p)P(b) = 1 \end{aligned} \tag{2}$$

If we were to replace the *p*="cars exist" with *p*="unicorns exist" the following to the best of our knowledge would be:

$$\begin{aligned} P(p) &= 0 \\ P(b) &= 1 \\ P(p \cdot b) &= P(p)P(b) = 0 \end{aligned} \tag{3}$$

The probability of a *truth* (T) *itself* being true is 100%, and the probability of a *falsehood* (F) *itself* being true is 0%. Now we consider the probability of the *unknown* (U). As was stated previously, *unknown* (U) is either *true* (T) or *false* (F) giving it the result of *true* (T), or a result higher than *false* (F). This means that the probability of any *unknown* (U) are considered to be the result of only one outcome (*o=1*) over the sum of possible outcomes (*outcome probability*).

$$\begin{aligned} P(T) &= 1 \\ P(F) &= 0 \\ P(U) &= P(T \vee F) = \frac{o_{T \vee F}}{o_T + o_F} = \frac{1}{2} \end{aligned} \tag{4}$$

This is in sharp contrast to *contradiction* between something being *true* and *false* at the same time, yet it may be possible that an interrelated *truth* or *falsehood* can exist at the same time as they may contain dependent elements of *unknown* (*time dependency or incomplete*)[2]. Under the consideration of *no* unknowns, a contradiction has a value of 0 probability:

$$P(T \cdot F) = P(T)P(F) = 0 \tag{5}$$

Formulation (4) states that "the probability of an *unknown* (U) being *true* (T) is 50%". Of course this also means that the possibility of the *unknown* (U) being a *falsehood* is also 50%, but the emphasis is on the probable existence of *truth*. This is the simplest derivation of the probability of an *unknown* with two possible outcomes, which in this case is either *true* (T) or *false* (F).

Now we consider the probability *x* being true based on a series of *10* prior *truths* and *1 unknown*. The *outcome probability* (P_{oc}) of such a truth is the series sum of actual prior *truth* outcomes over the total sum of prior possible outcomes which include all *unknowns*:

$$P_{oc}(x) = \frac{\sum_{T=1}^{10} o_T}{\sum_{T=1}^{10} o_T + \sum_{U=1}^{1} o_U} = \frac{10}{10.5} = 0.9523 \tag{6}$$

What this means is that *x* has a high *outcome probability* for truth within the limits of 10 *knowns* that are true and 1 *unknown*.

Formulation (6) can be generalized as:

$$P_{oc}(x)=\frac{\sum_{T=1}^{n} o_T}{\sum_{T=1}^{n} o_T+\sum_{U=1}^{u} o_U} \tag{7}$$

This is in very sharp contrast to the *actual* probable result of any *truth* containing any *unknown*:

$$\begin{gathered} P(x)=\prod_{T=1}^{10} P(x_T)\prod_{U=1}^{1} P(x_U)=1x\frac{1}{2}=0.5 \\ OR \\ P(T_1\cdot T_2\cdot T_3\cdot T_4\cdot T_5\cdot T_6\cdot T_7\cdot T_8\cdot T_9\cdot T_{10}\cdot U)=\frac{1}{2} \end{gathered} \tag{8}$$

What this means is that irrespective of any number of prior truths, the actual probability of *x* being true is *only* based on the number of prior *unknowns*. This is without considering that each prior *truth* also contains their own prior elements of *unknown*. Logistical arithmetic is associative, and therefore hierarchical by once again considering that each *truth* has prior *truths*.

$$\begin{gathered} P(x)=P(a)P(b)P(c) \\ P(x)=P(a)(P(d)P(e))(P(f)P(g)) \\ P(x)=(P(T_1)P(T_2)P(U))((P(T_3)P(T_4))(P(T_5)P(T_6)))((P(T_7)P(T_8))(P(T_9)P(T_{10})))=\frac{1}{2} \end{gathered} \tag{9}$$

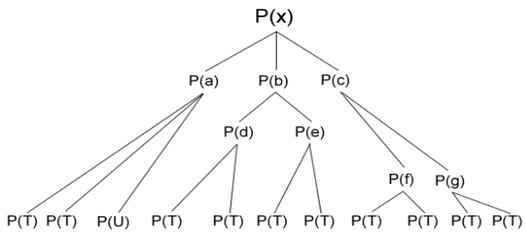

Figure 1: Logical Truth Associative Hierarchy

The full spectrum of human knowledge is full of known *unknowns*, and perhaps many more unknown *unknowns*, giving example formulations (8) and (9) a very unsettling reality in regards to all of human knowledge. That is that all human knowledge has a very low probability of actually being true.

Formulation (8) can be generalized as:

$$P(x)=\prod_{T=1}^{n} P(x_T)\prod_{U=1}^{u} P(x_U) \tag{10}$$

This has significant implications on all truths especially those resulting from scientific research. The primary *unknown* in science is *time*. Most truths are derived within only a small window (range) of time. For example consider the true statement of, "to the best of our knowledge, gravity has always been attractive." This means that if gravity is to remain attractive, our knowledge on gravity must not change. This statement is *time* dependent in direct reference to our knowledge. This is why many subjects are prefixed with the word "*contemporary*" and justly so. Therefore, formulations (7) and (10) can be augmented to include time dependent element:

$$P_{oc}(x,t)=\frac{\sum_{T=1}^{n} o_T(t)}{\sum_{T=1}^{n} o_T(t)+\sum_{U=1}^{u} o_U(t)} \tag{11}$$

$$P(x,t)=\prod_{T=1}^{n} P(x_T,t)\prod_{U=1}^{u} P(x_U,t) \tag{12}$$

Human knowledge changes over time, but what constitutes a change in knowledge? A change in knowledge is due to discoveries of new *truths* from prior known, or unknown, *unknowns, truths* or *falsehoods*. This includes discovering that a prior *unknown* was *false* (F) or *true* (T). If *false*, this changes the probability of a prior *unknown* to 0 and any hierarchically dependent probabilities also result in 0 in regards to formulation (10), but it does not change the result of probable outcomes from formulation (7) as significantly if *t=1, making this discovery a statistical anomaly.* For example, faster than light neutrinos

were, and currently remain, a statistical anomaly against all prior knowledge. Probability of truth is statistical. If time progresses and the new discovered truths remain consistent as they are *continuously* tested, than the following is true:

$$P_{actual}(x)=\lim_{t\to\infty}\left(\frac{P(x,t)+P_{oc}(x,t)}{2}\right)=1\vee 0 \tag{13}$$

Let us consider the possibility that there will always be unknowns. First, for the statement of "there will always be unknowns" to be true, human progress in knowledge would have to stop as the statement is time independent. Currently reality suggests that humans will progress in understanding indefinitely which may not be over infinite time, but we will assume that indefinitely means over infinite time for the sake of deduction on the current level of human knowledge and understanding (*truths* based). Assuming this statement is correct, even while humans progress indefinitely, or simply "there will always be unknowns while humans progress in understanding indefinitely", then it is deduced that for this statement to be true, there must currently exist an infinite number of *unknowns*. As was demonstrated using logic arithmetic from the formal logic system in formulations (8) and (9), all dependent *truths* in the associative hierarchy of *truth* are affected and become skewed towards *falsehood* with the introduction of a single *unknown* becoming *false*. A single *unknown* being discovered *false* (*P(x)=0*), will have explicit repercussion on all dependent *truths* by negating them explicitly and lowering the probability of truth on all dependent *truths*. It's a cascade effect across all currently dependent *truths*. Given this, our current level of knowledge (*truths* based) is in probability much closer to 0 than 1, and here is why:

$$\begin{aligned} P(U)&=0.5\\ P(H_U)&=\prod_{x=1}^{\infty}P(U_x)\\ &=(0.5)(0.5)(0.5)(0.5)(0.5)\ldots P(U_\infty)\\ &=\lim_{x\to\infty\vee n\gg 1}P(H_U)=0 \end{aligned} \tag{14}$$

Where $P(H_U)$ stands for what humanity currently doesn't know. Respectively, $P(H_T)$, stands for knowledge that humanity finitely (*n*) does know or has deduced to believe they know is *true*:

$$\begin{aligned} P(T)&=1\\ P(H_T)&=\prod_{x=1}^{n}P(T_x)\\ &=(1)(1)(1)(1)(1)\ldots P(T_n)\\ &=\lim_{x\to n<\infty}P(H_T)=1 \end{aligned} \tag{15}$$

Now if we simply combine formulation (14) and (15), we get the probability of current human knowledge being true:

$$P(H)=P(H_T)P(H_U)=(1)(0)=0 \tag{16}$$

In conclusion, this was an explicit exercise on the matter of probability between two extremes, *true* and *false*, in regards to collective human knowledge. The question was where do we lie between those two extremes on virtually everything or on the statement, "Is what we know more correct than not?" Based on the derived conclusion in formulation (16), we currently know nothing, or virtually nothing, in contrast to the grand scheme of things. It becomes very evident that unless all *unknowns* are known, we cannot be certain of absolutely anything due to the fact that all knowledge contains elements of the *unknown* no matter how small they maybe which have hierarchical repercussions on resulting *truths*. Knowledge itself is based on probability otherwise it would not be manageable within the limits of human knowledge as uncertainty is chaotic in nature and extensive in study, as studies into complexity have demonstrated[6]. Even the statement that "I am a person that exists", or "I am a *b* that *c*", comes into question as elements *b* and *c* may contain prior *unknowns*. Thus to quote Socrates:

> *"...I went to one who had the reputation of wisdom, and observed to him - his name I need not mention; he was a politician whom I selected for examination - and the result was as follows: When I began to talk with him, I could not help thinking that he was not really wise, although he was thought wise by many, and wiser still by himself; and I went and tried to explain to him that he thought himself wise, but was not really wise; and the consequence was that he hated me, and his enmity was shared by several who were present and heard me. So I left him, saying to myself, as I went away: Well, although I do not suppose that either of us knows anything really beautiful and good, I am better off than he is - for he knows nothing, and thinks that he knows. I neither know nor think that I know." ~ Socrates (470 BC-399 BC), Apology by Plato*

The previous quote can be summed up by the popular paraphrase, "*The only true wisdom is in knowing you know nothing.*" This is perhaps the greatest argument for resisting any form of dogma but the dogma of continuous enquiry, testing and change.

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