

Some Possibilities on Plausibility
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Figure 1: A fish with a bicycle.

As a mathematician and bio-physicist – at least by training – we decided to approach the concept of plausibility from a mathematical perspective first. What does this mean? Well, first people think math is hard so, aligned with this, we will make some obscure arguments and then try to explain them clumsily. Math is also axiomatic, so a first reaction to the concept of plausibility is to make sure we have a sound definition¹. Next, we would feel much more comfortable if we had a way to understand, specifically, whether or not something is plausible. Finally, we'll try to create some relevant linkages to the physical world we are finding that we actually live in, compared to the one we currently think we do (ah, the biophysicist comes out).

Let us explain more precisely why knowing whether or not something is plausible is so important from the perspective of a mathematician. Late at night in bars, mathematicians like to discuss the most fundamental, basic, underlying concepts in the universe: zero, infinity, e , π , pyramids, dodecahedron, and the color black.

While these are all cool, they all require an even more basic concept: a set. A set allows a mathematician to do math in the first place. A set really doesn't have a definition, but it has an important property: either something is in it, or something is not. So, for example, numbers make sense because the number 1 is equivalent to the set of all things with exactly a single object in them. We can't study the set of things that are big until we develop ways to measure; then suddenly we can. All mathematics follows: algebra, calculus, statistics, probability, dynamical systems – all of it. So if we are going to investigate plausibility as a mathematical construct, we need a way of knowing concretely if something is plausible. Is there a set of things that are plausible? If so, what could follow from that? History makes these compelling questions.

¹ Noun: 1. Believeable, 2. Persuasive 3. (of an argument or statement) Seeming reasonable or believable

Now plausibility seems to define something that seeks to be inclusive rather than exclusive. It enables us to consider things or events that are less than probable and less than possible, perhaps in a systematic way. On the other hand, it suggests excluding impossibilities. These arguments, when viewed from an axiomatic, theoretical perspective do fit nicely into the language and structure of measure theory in a straightforward way. The probability of an event that is *probable* has to be greater than one-half. The probability of an event that is possible has to be greater than *or equal to* zero. And the probability of an impossible event must be zero. The careful reader will notice that there are events that can occur with probability zero but are still possible. This situation occurs only when there are infinitely many possible outcomes; so choosing one of them results in essentially, dividing the number 1 by infinity.

$$\frac{1}{\infty}$$

There are a number of ways to describe this situation. We would like to propose, for the purposes of this plausibility reflection, calling them “1 out of infinity” events, things, situations, ideas, and notions.

Unfortunately, we still cannot know whether or not an event is plausible under this convention unless we first show that either (i) it is not impossible or (ii) it is possible. So any method in plausibility should more importantly include ways to discuss exactly the situations, events, and other objects of inquiry that this gray area is bounded within. Now we know what we are looking for, from a mathematicians lens, even if we don't know yet how to find it or what we might do with it.

Side Bar: This reductionist argument provides a plausibly valuable intellectual result based on an academic tradition that others are free to benefit from. It also frees us to have a conversation about a fish on a bicycle. This phrase has been around since the early 1970's and has been used to explain the relationship between man and God, and later women and men². Before explaining why a fish on a bicycle may or not be plausible, it is worth noting that there is some value as evidenced by “the test of time” to consider such things.

We have employed a usual technique of setting constructs against each other to gain some structure. In this case, we have offset plausibility with impossibility-plausibility-possibility-probability. In so doing, we gained - or perhaps artificially framed - some interesting intellectual space that can help link the pursuit of a robust definition for plausibility with today's looming complex challenges.

Comparing plausibility to other self-complementary constructs that are currently popular, for example uncertainty-certainty, the plausibility/improbability construct offers some real value. The uncertainty debate seems to often default into a

² <http://www.phrases.org.uk/meanings/414150.html>

conversation about probabilities, reduced error bars, and a small bit of acceptance of the limits of models. It typically leaves aside the human dimension so prevalent in today's human-dominated biosphere in favor of a proposed "rational" and quantitative-dominant approach. Even though the conversation is now endemic, the multiple types of uncertainty are explained in ways that try to reduce the uncertainties simultaneously with accepting a broad nondescript vocabulary. In other words, once uncertainty is identified, the academic response is to eliminate it rather than become comfortable with it.

Perhaps plausibility can create a more comfortable construct that does not beg for its own self-destruction. If so, then perhaps, this exploration represents a "mind bending" opportunity that comes before a paradigm shifting or institutional altering effort. Looking at the sustainability challenges facing each of us today, it is clear that strategic-planning capabilities and decision-making methodologies are not sufficient to the new system-wide space humans now represent on the planet. Economic meltdown and climate heat-up all point to the need for new ways to describe coupled human-natural systems and suggest that our current definitions and explanatory systems are only capturing a fraction of the real world; this is an approximation of reality that must be updated.

If a deeper exploration of "plausibility" can capture both the need for pushing the quantitative envelope and enhance the capturing and integration of the "human element" in the next generation of decision-making and planning methods, means and institutionalization, then let the workshop begin!