Scientific Literacy: What qualifies as Science and what doesn't

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For every complex problem there is an answer that is clear, simple, and wrong. — H.L. Mencken

GOOD Morning to one and all present here, today I, Ashwin Goyal, stand before you to discuss a very important topic that holds the foundation of our future generations, The rise of Pseudoscience. In todays day and age of tech surrounded society, where every answer is a simple google search, it is really important to realize what qualifies as science and what doesn't, especially in brutal times like these where a deadly pandemic is on rise.

On this occasion, I would like to point out some facts on what qualifies as science (and what does not).

Current Scientific Standards demand:

1. Falseability of hypotheses;
2. High and consistent reproducibility of results;
3. Deterministic relationships (or at least deterministic distribution of outcomes);
4. Actual Causation, not just correlation;
5. A leap of Abstraction, or at least a meaningful generalization.
6. Desirable to have a mathematical description, which can be computer simulated.

Too many people claim to be doing Science for the vanity of being trendy.They typically and repeatedly claim on:

1. Correlations (not mechanistic causations);
2. Try to find meaning where there is none: offer no meaningful generalizations whatsoever (actually, many of them push for purported relationships which are mostly personal musings on how things can be imagined, in their irrelevant fantasies);
3. Insist on that "statistical regression and analysis of variance" has the same value as a Physics conservation law;
4. Apologize that the Human Mind is a too-complex system one cannot oversimplify to Physics/Biochemistry/Artificial Intelligence (which immediately dismisses any reasonable attempt to translate any phenomenon into measurable and predictable atomic pieces of repeatable facts);
5. Likewise, Philosophy tries to hijack its way back into trendy by claiming its original importance

Please avoid asking "why" and insisting. If you really want a well posed answer, ask "How does", "What causes" and "What's the reason for". That will get you properly answered. I've been told that a physicist never asks why and must always ask how. Is this true? Have all discoveries in physics been due to asking how? or have some been discovered by asking why? English is pretty imprecise and asking questions of the form "Why does . . . " feels natural even when "How does . . . " would suffice. "Why" has philosophical overtones because it goes beyond just "How". Physics is a science and the scientific method is tried-and-true method for gaining knowledge about how things work. I'd suggest that in any place you have a question "Why does . . . " try to substitute it with "How does . . . " instead. Any portion of "Why does . . . " not answered by "How does . . . " is the philosophical / non-scientific portion of the question. For example "Why does 1 + 2 equal 3?" can be substituted with "How does 1 + 2 equal 3?" and answered adequately. Depending on how deep and technical you want to get, the answer may delve into the definition of addition, various axioms, peano arithmetic, and so on. If you still have a question about "why" after all of that, your question is of a philosophical nature.

I would like to add another quote by Dr. Richard P. Feynman:

It doesn't matter how beautiful your theory is, it doesn't matter how smart you are. If it doesn't agree with experiment, it's wrong."

— Richard P. Feynman

The above quotes states a simple meaning, for a hypothesis, for it to considered a scientifically valid arguement, it should match reality.

Another a scientific tools that goes hand in hand with this thought is Occam's Razor, that An easier to understand explanation by any means grants it a higher probability of being the correct one, among other many hypotheses.

That being said, Not that easier to understand, simpler hypotheses shall be preferred. Instead, take those that pose the least / fewer requirements to be satisfied, in order for the consequence to be determined / computed.

I would like to end today's discussion with an example on Physics settling an otherwise Philosophical question:

"The ship of Theseus, also known as Theseus's paradox, is a thought experiment that raises the question of whether an object that has had all of its components replaced remains fundamentally the same object."

From standpoint of Physics, the original object is the one with new parts: subatomic particles and force-mediating virtual particles are all Indistinguishable. What stands out as relevant is HOW the specific parts are assembled, much like in Minecraft game (only that our blocks are atoms instead). Even more, provided that the reassembly is bit-wise and exactly equal to the original (now with new parts), there can even be two originals.