"All Models Are Wrong, But Some Are Useful"

Post by “Cassius” of January 21, 2024 at 11:21 AM

In past discussions here on the forum we have used the analogy that "the map is not the territory."

A few minutes ago I just happened to come across this saying, attributed at least in its present form to statistician George Box, that seems to make a very similar point.

I suspect I will find this a useful saying in the future so wanted to post about it:

> **All models are wrong** is a common aphorism and anapodoton in statistics; it is often expanded as "All models are wrong, but some are useful". The aphorism acknowledges that statistical models always fall short of the complexities of reality but can still be useful nonetheless. The aphorism originally referred just to statistical models, but it is now sometimes used for scientific models in general.[1]
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> The aphorism is generally attributed to the statistician George Box. The underlying concept, though, predates Box's writings.

All models are wrong - Wikipedia

Post by “Joshua” of January 22, 2024 at 12:04 AM

Einstein on mathematics:

> Quote
>
> One reason why mathematics enjoys special esteem, above all other sciences, is that its laws are absolutely certain and indisputable, while those of all other sciences are to some extent debatable and in constant danger of being overthrown by newly discovered facts. In spite of this, the investigator in another department of science

> would not need to envy the mathematician if the laws of mathematics referred to objects of our mere imagination, and not to objects of reality. For it cannot occasion surprise that different persons should arrive at the same logical conclusions when they have already agreed upon the fundamental laws (axioms), as well as the methods by which other laws are to be deduced therefrom. But there is another reason for the high repute of mathematics, in that it is mathematics which affords the exact sciences a certain measure of security, to which without mathematics they could not attain.
>
> At this point an enigma presents itself which in all ages has agitated inquiring minds. How can it be that mathematics, being after all a product of human thought which is independent of experience, is so admirably appropriate to the objects of reality? Is human reason, then, without experience, merely by taking thought, able to fathom the properties of real things?
>
> In my opinion the answer to this question is, briefly, this:—As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.

This entails, among other things, dismissing a lot of what Plato thought was true about mathematics. If Euclid and others like him can derive from the basic axioms of geometry a profound understanding of its higher operations, can the philosopher working by analogy use pure reason to escape the cave of sensory illusion by taking hold of absolute truth? Just as all of math is innately embedded in its axioms, is all knowledge innate and all 'learning' merely rediscovery of what we knew before our souls were imprisoned in our sluggish flesh?

Epicurus is often criticized for his aversion to math. But his real distaste was for the kind of philosophy that used faulty assumptions about math and reason to arrive at conclusions that were divorced from reality.

Post by “DavidN” of January 26, 2024 at 6:58 PM

> Quote from Joshua
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> Epicurus is often criticized for his aversion to math. But his real distaste was for the kind of philosophy that used faulty assumptions about math and reason to arrive at conclusions that were divorced from reality.

I have been arguing for a few years now, that theoretical modeling needs to be removed from the sciences if it can never be tested and placed in its own category, or that it needs to be

understood in its proper context until it can be tested. To many plebes run around thinking that models are scientific proofs, they are not. I had this same argument with a friend a few weeks ago. I believe as an Epicurean I must keep an open mind to all the reasonable possibilities on a subject until proof is available, and even then one must be open to the chance of error. Especially in todays world with fake news, deep fakes, and politically charged "science". I choose to approach modern "science" with a healthy skepticism.

Post by “Martin” of May 14, 2025 at 1:55 AM

Here is an article why the reliance on models/theories in science and the realism-anti-realism dispute in the philosophy of science should not turn us into Sceptics:

"When is a Fact a Fact?": A Conversation with Peter Vickers

I found the link at Philosophy Matters on: Facebook

Post by “kochiekoch” of May 14, 2025 at 1:49 PM

> Quote from Martin
>
> Here is an article why the reliance on models/theories in science and the realism-anti-realism dispute in the philosophy of science should not turn us into Sceptics:
>
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I understand 5 sigma certainty is the gold standard: 🙂

Why do physicists mention “five sigma” in their results? | CERN

Post by “Novem” of May 20, 2025 at 5:35 PM

"In philosophy of science and in epistemology, instrumentalism is a methodological view that ideas are useful instruments, and that the worth of an idea is based on how effective it is in explaining and predicting natural phenomena. According to instrumentalists, a successful scientific theory reveals nothing known either true or false about nature's unobservable objects, properties or processes.[1] Scientific theory is merely a tool whereby humans predict observations in a particular domain of nature by formulating laws, which state or summarize regularities, while theories themselves do not reveal supposedly hidden aspects of nature that somehow explain these laws.[2] Instrumentalism is a perspective originally introduced by Pierre Duhem in 1906.[2]

Rejecting scientific realism's ambitions to uncover metaphysical truth about nature,[2] instrumentalism is usually categorized as an antirealism, although its mere lack of commitment to scientific theory's realism can be termed nonrealism. Instrumentalism merely bypasses debate concerning whether, for example, a particle spoken about in particle physics is a discrete entity enjoying individual existence, or is an excitation mode of a region of a field, or is something else altogether.[3][4][5] Instrumentalism holds that theoretical terms need only be useful to predict the phenomena, the observed outcomes."

I suppose many people's views here fall under this philosophy of science? It's also Epicurean to study nature - do science - for our own benefit as it reduces uncertainty and anxiety and gives us peace of mind and pleasure with that knowledge. That's an instrumental view of science.

And that we are pragmatic when it comes to metaphysical or epistemic certainty and skepticism - accept or reject/revise a scientific claim/model/theory when evidence confirms or fails to confirm beyond a reasonable doubt - like in Martin's article. Otherwise we really cannot live our lives if we are paralyzed by extreme skepticism or by trying and theorize and rationalize our way through without testing to see if those rationalizations have merit.