Forum

In Response to Kalanov: A Crisis for Physics or Limitations of Logic?

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Abstract

The paper by Temur Kalanov "The Crisis in Theoretical Physics: The Problem of Scientific Truth" asserts that "The existence of logical errors is irrefutable proof of incorrectness of the theoretical foundations" of Physics. While Kalanov raises some legitimate concerns about how we have come to found our current theoretical edifice, it is my view that he is incorrect to assert that this constitutes disproof. His work may show that some of our cherished notions have a flimsy basis, if we believe his construction, but this is not the same as showing that these notions are incorrect.

Key Words: physics, crisis, limitation, truth, logic.

Temur Z. Kalanov raises several concerns about the current state of Physics, in his paper "The Crisis in Theoretical Physics: The Problem of Scientific Truth" which bear consideration. But I am of the opinion that what this paper actually points out most strongly is how what we have learned in the last 100 years or so is at odds with common logic and objective realism, and that this discrepancy needs to be addressed. This is a bit different from irrefutable disproof of the basis for Physics – which is what Kalanov claims to offer – however it is reasonable to ask what constitutes truth, if the facts of reality and our interpretation thereof are at odds, and the basis for our interpretation can be shown to be logically inconsistent. Therefore; I can affirm Kalanov's motives for seeking to point out that the basis for various notions of theoretical Physics is incomplete or inconsistent, and may harbor flaws of logic or mistaken judgments. However; I disagree with his conclusions, feeling that perhaps the fault lies not with Physics – but with our system of Logic, and with our idea of what constitutes a firm logical basis for facts.

While the discussion in Physics circles centers on the idea that it has been nearly impossible to craft a theory which correctly explains or accommodates both Relativity and Quantum Mechanics, Kalanov's paper correctly points out that this indicates two symptoms of a larger problem – that both of these notions pull us away from the firm logical basis that exists for purely Classical theories. Worse still; these two idea streams do not offer a way out of the logical contradictions, but instead appear to pull us in very different directions, and insist that we view Classical Physics as a special case of a larger theoretical space, which has thus far eluded a consistent singular description, despite our attempts to propound one. This casts doubt on the idea that clear progress has been made, and justifies Kalanov's notion that we must examine the basis for our theoretical constructs, to determine if perhaps errors were made in the way our ideas are framed. It is my opinion that Logic is not privileged or immune, however, but is instead one of the theoretical constructs that must be examined, to determine its validity – or to assess its value as an arbiter of truth.

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We must acknowledge that we have made assumptions in order to examine them. Kalanov's paper compels the reader to examine the logical basis for theoretical Physics, advancing the notion that if this basis is inconsistent, or if the logic is otherwise flawed, we must reject the theory. I am not convinced, however, and I firmly believe that Kalanov has made an error of judgment, as this is clearly a case where the absence of proof does not constitute the proof of absence. The claims made in his paper are firmly rooted in the idea that nature is unambiguous, which is reflected in the logical rule of the excluded middle. This becomes Boolean logic, either-or thinking, or a binary distinction. The law of excluded middles will not admit or allow for possibilities outside of A or B, true or untrue. And this is all fine, but it may not reflect reality or reveal the universe in all its glory. This brief letter will not allow a full discussion, but there are reasons to believe that reality is not subject to Logic, when it is framed in this way, or that our notions of what is logical must be expanded somewhat – if we are to understand the universe as it really is.

First, we must acknowledge that our models are not the reality which they describe. Korzybski stated that 'the word is not the thing' and 'the map is not the territory,' but one could add formulas used in Physics and the rules of Logic to the list. We construct symbolic representations in order to perpetuate and extend our understanding, but they remain a proxy or symbol, and do not constitute reality. Instead; they are representations of our beliefs about what is real. And a belief is nothing more than a feeling of certainty. But in the 1890s, the picture of scientific reality which conveyed such a sense of certainty that some felt there were no more important discoveries to be made – gave way to a whole new era of revolutionary discoveries and exciting developments. Two of those developments, Quantum Mechanics and Relativity, forced us to re-examine what we knew before. Kalanov and others point out that some of this work leads to logical contradictions or emerges from a flawed logical basis. I believe that this is because the idea that nature is purely unambiguous is in error, and this fact makes the law of excluded middles false. Thus conventional logic fails us.

Nature quite definitely allows things to exist in more than one state at a time, in the case of quantum-mechanical superpositions. And robust quantum-mechanical behaviors including superposition and entanglement are not limited to only the realm of the ultra-small or ultra-cold. Anton Zeilinger stressed this point in his lecture at FFP11 [1], stating that quantum effects extend well into the regime thought to be purely classical, and citing the example of C60 molecules at temperatures up to several thousand degrees Kelvin. When double slit experiments are performed with these molecules, the familiar diffraction pattern is observed, but when only one molecule comes through the apparatus at a time it appears to strike the target at a random location. In the cosmos, Relativity insures that ambiguity in nature does not go away at the large scale, and instead assures that two distant and non-comoving observers will have a different view of the same events. The idea of a simultaneous observation that is the same for all observers breaks down in a radical way, once we introduce relativistic speeds and distances, and this too has been observed. It is not as though a logical proof that this is not possible has any bearing on what is real.

While Kalanov's paper raises many interesting questions, and successfully asserts that the logical basis for much of modern theoretical Physics may be erroneous, this does not prove that those theoretical constructs are false. Rather; it points out that there is stark disagreement between the conclusions of Aristotelian Logic and what Modern Physics asserts is true. This failure of logic does not necessarily mean Physics is in a crisis, although that might indeed be the case. The other possibility is that Logic may need to be expanded, in order to admit all of what is real. This seems

more realistic to me. Marni Sheppeard suggests (at FFP10 - for example) [2] that particle mass triplets can be understood in the context of nature's using Ternary logic in some instances, instead of the more familiar binary or Boolean version, and it makes sense to use what works, where it applies. My impression is that perhaps Temur Kalanov has attempted to force agreement of Modern Physics with common logic where it does not naturally fit, or at least does not universally apply.

It is not necessarily true that nature must follow logic to be factual. However; any system of logic must be true to nature, in order to be factual. In Physics, we are trying to obtain understanding of principles by which what is real can make sense to us. In order to do this, we must develop concepts and formulate theories. Properly understood; they are models for and symbols of what is real, so they can't easily be confused with reality. But the fact that some people regard theories as though they are something real, because they offer a faithful representation of the world of facts, makes it necessary to examine their logical basis, as Kalanov has done. And he has sincerely pointed out what appear to be errors in that logical basis. Perhaps it is an exaggeration to say that this constitutes a crisis in Physics, because many have already accepted that reductionist determinism is falsifiable, and have attempted to allow for broader logical conceptions of reality. Some people in Physics are actively involved with questions about the limits or breakdown of objective realism, common logic, and determinism. However; the rest of us may need someone like Temur Kalanov to remind us that Modern Physics is, in many ways, illogical.

References

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