Even Physicists Still Don’t Understand Quantum Mechanics Because it is an Absurdity

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Abstract

This note is in response to the essay “Why even physicists still don’t understand quantum theory 100 years on” by Sean Carroll published in Nature on 3 February 2025. The note entices a physical and mathematical critique of quantum mechanics. Arguments are given that quantum mechanics is an untenable idea applied to a physical model and a formalism developed, requiring ad hoc corrections for calculating properties, similar to corrections in the empirical formulae arrivingfrom no theory in engineering methods.

It is found that Max Planck’s[1] failure, discovered by C. I. Noninski[2], to derive the blackbody radiation equation, putting into question the survival of quantum mechanics, is innate in the initial premises of this derivation, which do not allow it to even reach the stage of the derivation, analyzed by C. I. Noninski.

Mathematical postulates of quantum mechanics are also reevaluated, pointing to evidence negating their consistency. This questions the various proposed quantum mechanics applications, such as quantum computers, and their rooting in reality, as far as physics and its formal description is concerned.

Science thrives on critique. The role of critique is paramount especially when areas such as quantum mechanics, which is considered to symbolize the modernity in studies across disciplines, tends to occupy a leading position in science, while engineering and technology seek to borrow ideas from science for their practical applications. Given the stakes involved, any discrepancies in foundational theories like quantum mechanics must be rigorously addressed. Recent developments, particularly claims regarding quantum computing, necessitate a critical examination by the scientific community. It is essential for scientists to scrutinize whether quantum mechanics, as currently understood, provides a valid physical basis or if its mathematical formulations are coherent. This scrutiny is crucial as it questions the direct applicability of quantum mechanics to quantum computing technologies, suggesting that what is marketed as quantum computing might primarily be an advancement in software engineering rather than a direct application of quantum physics. This paper aims to provoke a reevaluation of quantum mechanics from both physical and mathematical perspectives.

The first person to discover that quantum mechanics has no physical grounds is C. I. Noninski[2]. This note adds to this critique, pointing to an earlier foundational flaw in the derivations of ref.[1], negating from the outset anything that follows. To be successful, a scientific theory should derive such a formula, not just obtain it by the engineering methods of curve-fitting experimental data, as is the case.

Yves Couder[3] has experimentally demonstrated, on a classical, macroscopic scale, the main effects attributed to quantum mechanics that are said to apply only to the micro-world. This is a strong experimental support for the view expressed here.

Notwithstanding the above physical arguments, doubts about the validity of the mathematical basis of quantum mechanics have been expressed separately, most prominently by Einstein, Podolski, and Rosen[4]. However, their criticism wrongly treats the state functions (called wave functions in their text[4]) discussed as if these state functions actually have physical meaning, and proceeds to explore these state functions only insofar as they actually fully describe the state of a system. The problem, however, is on a more fundamental level. The authors of ref.[4] have failed to recognize that they are in fact dealing with non sequitur; i.e., meaningless entities, as will be shown. This nongermane criticism has later allowed some to flip the script and, instead of reassessing the very existence of quantum mechanics, the critique in ref.[4] has led them to present the conjuring with these non-entities as a great success, which even seemed to them to promise the creation of principally new computers—quantum computers.

Classical Derivation by C. I. Noninski

In addition to the substantive critique of quantum mechanics, C. I. Noninski's 1964 paper[2] puts forth a derivation of the blackbody radiation formula, based on classical physics. Prior to C. I. Noninski's 1964 paper[2] the difficulties in deriving this formula were never overcome, and even caused the emergence of a distracting trend in physics known as quantum mechanics, which diverted physics from its goal of truthfully describing reality. Unlike Max Planck, who in his quantum mechanics founding paper[1] used Boltzmann's entropy formula for his failed attempt, C. I. Noninski[2] based his successful classical derivation of the blackbody radiation law on Boltzmann's energy distribution. C. I. Noninski's paper[2] is a seminal contribution to science. It will be the subject of future communications, especially C. I. Noninski's classical derivation of blackbody radiation, which is the only correct derivation regarding this phenomenon, with far-reaching implications for physics.

Main Findings

This note argues that Max Planck's failure to derive the blackbody radiation formula begins earlier in Planck's 1901 paper[1] than the problem in that paper first pointed out by C. I. Noninski in his 1964 paper[2].

More specifically, this note concludes that the problems start with Boltzmann's entropy formula $S_N =$

$k \log W + const$ (eq. (3) in §2 of ref.[1]), for the entropy $S_N = NS$, and end right there, in failure of the pursuit in ref.[1] aimed at deriving the blackbody radiation formula, where N is the total number of resonators, S is the average entropy of a resonator, k is the Boltzmann constant and W is the probability **"so that the resonators together have the energy U_N" (*"der Wahrscheinlichkeit dafür, dass die Resonatoren insgesamt die Energie* U_N *besitzen"*)**[1].

The formula $S_N = k \log W + const$ is the supposed basis in ref.[1] for the derivation of the blackbody radiation formula, but, unaccounted for by Max Planck, gives entropy value $S_N = 0$ in the studied case, because the probablity W of all resonators to have energy U_N can be nothing other than $W = 1$. This results from the fact that the resonators together have fixed average energy, which is an unchangeable initial condition for the Planck derivation presented in ref.[1] Being a definition and an initial condition makes the certainty of U_N absolutely true by default.

An absolutely true definition, moreover given as an initial condition, enjoys 100% certainty. Consequently, its probability W is unity.

The fact that the probability that the resonators together have energy U_N is unity by default, means that (**"after suitable determination of the additive constant"**[1])

$$S_N = k \log W = k \log 1 = 0. \qquad (1)$$

This point has to be emphasized—when the value of U_N is given as a certain single value, as Planck defines it in his eq.(1) and eq.(4) of ref.[1], this energy U_N cannot at the same time be defined in terms of probability, e.g., that that there is a finite probability that U_N is also of the value $U_N + \delta$ or also of the value $U_N - \delta$, where δ is some small amount of energy. If such an idea should arise; i.e., that quantum mechanics does not consider that a system can have a given, only one specific energy, but only a spread of possible energies; i.e., a superposition of different energies, then this idea should be allowed only after making sure that quantum mechanics is sound, not by *petitio principii*, by presupposing it. As seen, from eq.(1) here, considering the definition of the exact, not probable, value of U_N, namely, $U_N = NU$ (eq.(1) in §2 of ref.[1]), it follows that quantum mechanics stumbles at its very first step. Not to mention that the mere considering that something defined as certain, such as $U_N = NU$, can at the same time be uncertain, by assigning to it a probablilty W, is in itself untenable.

The impasse in eq.(1) stems from the fact that Planck first defines that the total energy of N resonators is of specific fixed value $U_N = NU$, where U is the average energy of the single resonator and the corresponding entropy of N resonators is of specific fixed value $S_N = NS$, where S is the average entropy of the single resonator. But then, Planck backs off, as if he hasn't yet defined what S_N is, and redefines it as $S_N = k \log W + const$, positing that the same value U_N of the total energy, which in eq.(1) in §2 of ref.[1] he defined as certain, namely, $U_N = NU$, is at the same time uncertain; that is, that it can have a probability W less than unity, that the total energy's value is U_N.

This error of assuming the dubiousness that a fixed, specific given value U_N is not a fixed value, but has a probability W other than $W = 1$ of being U_N, seeps further into the derivation, making it flawed. The fallacy to assign probability to a fixed number is unacceptable not only because **"in the basic assumptions of electromagnetic theory there is no definite evidence for such a probability"[1]**. This fallacy stems from a fundamental misunderstanding of probability, which by definition does not apply to exact, given values where the probability of these values being permanently assigned, is always unity. Merely applying a formula like $S_N = k \log W$ without grasping its physical implications, where certain quantities cannot be treated as uncertain, is not scientifically sound and could lead to erroneous conclusions. Such an application of the formula without consideration of the physical implications where certain values are treated as probabilistic could lead to misinterpretations in scientific analysis.

This problem of inappropriate treatment of a given value of U_N as a value with assigned probability (which, incidentally, is always 1 for a given value of U_N) in order to use that inappropriate probability to obtain entropy by using Boltzmann's entropy formula, is not aleviated by Panck's replacing said inappropriate probability W with the equally inappropriate quantity $R = \frac{(N+P)^{N+P}}{N^N . P^P}$, comprising the total number of "complexes" of distributing the total number P of energy elements ε amongst the N resonators, corresponding to a given total vibrational energy U_N. The quantity P is the quantity into which Planck famously apportions the energy U_N, postulating that U_N is not **"a continuous, infinitely divisible quantity but ... a discrete quantity composed of an integral number of finite equal parts"**[1], which Planck calls energy elements ε, so that $U_N = P\varepsilon$. This postulate fails right at this moment.

Specifically, Planck proposed that the probability W is proportional to R, justifying the substitution of W with R in his calculations. By doing so, Planck puportedly found a manageable method to represent the inherently probabilistic quantity W with a formulaic expression, R. Thus, under

Planck's assumption, R, being defined by a formula, could replace W in theoretical derivations.

However, Planck need not invoke the help of R as a substitute for the probability W that the energy is U_N, in order to make Boltzmann's expression more formulaic, because knowing P, which is a part of R, ensures that we at once know U_N with full certainty, since $U_N = P\varepsilon$. Therefore, it is superfluous to introduce a new parameter R, albeit W is assumed proportional to R, because the earlier problem persists—knowing R, means that we know P, hence we know $U_N = P\varepsilon$, which is fully certain, and therefore $W = 1$, which reproduces the failure already discussed.

The seeming escape from probability, by introducing R, is palliative. R is connected with probability, because Planck introduces R as W proportional to R, so the connection of the formulaic R and the probabilistic W still exists, while the established, fixed number $U_N = NU$ has nothing to do with probability.

Planck implies that U_N has to do with probability, but he is wrong. Stating that a system has a total vibrational energy $U_N = NU$ leaves no room for hesitation about the full certainty of that fact.

To repeat, the introduction of R by Planck as a means of handling probability can be seen as an attempt at a solution rather than a resolution. Although Planck posits W as proportional to R, thereby linking R to probability, this approach conflicts with the deterministic nature of a fixed total energy $U_N = NU$. Here, Planck's assertion that U_N relates to probability is misaligned, given that stating a system has a total vibrational energy $U_N = NU$ inherently implies full certainty about this state. Also, as already noted, the implication that quantum mechanics never treats U_N as fully certain would be acceptable, provided quantum mechanics at this stage of the derivation has already been validated. As seen, quantum mechanics fails its verification at the outset. Therefore, positing conclusions following from quantum mechanics at this stage is unjustified.

As a detail, it can also be noted, that the probability W that a system of N resonators possesses a given energy U_N is independent of the number of energy elements P, even if the concept holds that energy is not continuous but consists of discrete energy elements ε into which the energy U_N can be divided. A specific energy amount U_N, once chosen, does not vary in its probability due to changes in P; its probability remains unity. Adjusting P alters the total energy within the system, yet the probability of the system exhibiting this new total energy also defaults to $W = 1$, thereby highlighting the conceptual issue discussed.

Follow-Up Argument

That expressing entropy as $S_N = k \log W + const$ is incorrect also follows from the fact that after Planck taking the logarithm of this expression with R substituted for W and rearranging it, the following expression is obtained

$$S = k\left\{\left(1+\frac{U}{\varepsilon}\right) log \left(1+\frac{U}{\varepsilon}\right) - \frac{U}{\varepsilon} log \frac{U}{\varepsilon}\right\}, \qquad (2)$$

which is an incorrect relationship because it infers, as C. I Noninski[2] noted, that when entropy S of a resonator is zero its vibrational energy U is also zero. This is contrary to what the reality is. It is strange that Planck himself correctly writes, but forgets it later in the course of the derivation, that **"If amplitude and phase both remained absolutely constant, which means completely homogeneous vibrations, no entropy could exist and the vibrational**

energy would have to be completely free to be converted into work."[1] In other words, when the entropy S of a resonator is zero, vibrational energy U of that same resonator, which is a **"time average, or what is the same thing, ... a simultaneous average of the energies of a large number *N* of identical resonators, situated in the same radiation field"[1]**, is not zero and would have to be completely free to be converted into work. This is contrary to what follows from eq.(2), namely, that if $S = 0$ then $U = 0$, which is physically incorrect and contradicts Planck's own inderstanding cited above.

Given the apparent foundational inconsistencies in ref.[1], particularly with respect to making Boltzmann's entropy equation $S_N = k \log W + const$ the cornerstone of quantum mechanics, and the proposed view that the energy of the resonators is discrete, rather than continuous, it becomes evident that these theoretical underpinnings suffer from what appears to be an irreparable flaw. This observation necessitates a definitive statement rather than cautious speculation. The implications extend beyond mere theoretical discrepancy; they challenge the very legitimacy of the proposed quantum hypothesis $U_N = P\varepsilon$, which is the key element of all quantum mechanics. Thus, it is not merely a matter of academic normativity but of intellectual honesty to assert that there exists a critical deficiency in the physical foundations of quantum mechanics that cannot be reconciled through additional theoretical work.

In contrast, C. I. Noninski in ref.[2] presents a seminal contribution, deriving the blackbody radiation formula on purely classical physics grounds. Hence, the alleged crash of classical physics in deriving the blackbody radiation law, leading to apparent dead-ends, such as the "ultraviolet catastrophe"[5,6], is in error. Rayleigh[5] and Jeans[6] have, contrary to what the equipartition theorem requires, applied the theorem to the atoms having a certain velocity, rather than to the averaged velocity of all the atoms in the ensemble, which is the correct way to apply the theorem. Thus, the "ultraviolet catastrophe"[5,6] is only illusory and a result of wrong application of classical physics.

Incidentally, C. I. Noninski has demonstrated that classical physics is inherently quantum, but for reasons completely different from those purported in ref.[1] The reasons why classical physics is innately quantum are clearly derived by C. I. Noninski in ref.[2], which is to be discussed elsewhere.

The physical arguments discussed should be sufficient for inciting reevaluation of quantum mechanics. However, contemporary discourse on the matter heavily relies on the mathematical framework of quantum mechanics. Therefore, an outline of the problems in this framework is in order.

Mathematical Argument

Should one, in addition to the above physical grounds (fully enough in and of themselves to reevaluate quantum mechanics), need purely technical grounds to reevaluate quantum mechanics, one may inspect the postulates of quantum mechanics stated in the form of eigenfunction equations. Thus, it is at once obvious that the position eigenfunction equation in position space, considered as one of the postulates of quantum mechanics:

$$\hat{x}\psi_x(x) = a\psi_x(x)\,, \tag{3}$$

where $\hat{x}$ is the position operator, which is the independent varible x itself, $\psi_x(x)$ is the position eigenfunction in position space and a is the eigenvalue, is valid for any thinkable function at all and any eigenvalue whatsoever, because obviously the equality $x = a\frac{\psi_x(x)}{\psi_x(x)}$ is fulfilled for any function $\psi_x(x)$. Such lack of a unique solution (unique function) of eq.(3) makes it indeterminate when it comes to using it for calculating the position of a particle—that equation allows the particle to occupy any position in space, which the particle does not do in reality. In reality, every particle occupies a given place x in space and does not occupy all space, let alone that position being described by any function possible, as the sxpression $x = a\frac{\psi_x(x)}{\psi_x(x)}$, following from the position eigenfunction equation, eq.(3), suggests.

In order to "solve" this problem, a delta-construct $\delta(x-a)$ is pulled out of thin air, unjustifiably pronouncing it a solution of the above eigenfunction equation. However, not only is $\delta(x-a)$ not a solution to the above eigenfunction equation, which disqualifies it as a mathematical object suitable to be part of quantum mechanics, but $\delta(x-a)$ cannot be normalized in the Hilbert space, which would guarantee its belonging to that space. Indeed, by treating one of the $\delta(x-a)$'s as the test-function, while treating the other $\delta(x-a)$ as the delta-construct, and then comfortably applying the definition of the delta-construct (note as a curious detail—complex conjugate of $\delta(x-a)$, needed for the normalization of $\delta(x-a)$, is this same $\delta(x-a)$). and also, for an easier demonstration, using the Cauchy definition of the delta-construct, we get the normalization of x in bra-ket notation to yield:

$$\langle x|x\rangle = \int_{-\infty}^{+\infty} \delta(x-a)\delta(x-a)dx = \delta(a-a) = \frac{1}{2\pi}\int_{-\infty}^{+\infty} e^{iy(a-a)}\,dy = \frac{1}{2\pi}\int_{-\infty}^{+\infty} dy = \infty. \qquad (3)$$

The integral does not converge. It is indeterminate. Therefore, the delta-construct cannot be normalized in the Hilbert space; i.e., the alleged solution $\delta(x-a)$ does not belong to the Hilbert space.

However, all solutions, if they were to be physically viable, must belong to the Hilbert space, and be prone to proper finite normalization, a condition which, as seen, $\delta(x-a)$ does not fulfill.

Similar arguments apply to the rest of the eigenfunction equations (momentum, Schrödinger's etc.) which we need not discuss because the above is enough to prove the alleged mathematical machinery forming the postulates of quantum mechanics defective. No other details and additional flaws, also unacceptable, such as the *petitio principii*, quite nonchalantly and liberally used in quantum mechanics, need be discussed as well.

An overall point that can be made from the above is that acclaimed alleged phenomena such as particle entanglement, the basis of the imagined quantum computers, quantum encryption and quantum teleportation, are not real. These pseudo-phenomena are the result of manipulation using senseless mathematical constructs.

Conclusion

An overall conclusion from the above is that quantum mechanics requires reevaluation and when it comes to the quantum character of nature, all efforts must be reverted to classical physics (physics without the theory of relativity and quantum mechanics), which is intrinsically quantum, as first pointed out by C. I. Noninski[2], who derived the expression for exchanging energy portions among the oscillators, rather than quantized energy possessed by the oscillators themselves. If this critique holds and gains momentum then the future of physics will revert exclusively to exploring development of classical physics. Initial ideas to this effect are presented by this author elsewhere and their advances will be the subject of discussion in future communications.

References

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