Can Relativity Be Considered Consistent?

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Abstract: The aim of this article is to localize nonlocality within the theory of relativity by applying Gödel's incompleteness theorem to it. The technique applied in this article is based on cultivating consistency within the normal language. When this is achieved this consistent language can then be used to describe the logical system of relativity. According to Gödel's incompleteness theorem it will be possible to reveal the incompleteness of relativity by creating a statement, which is impossible to either prove or disprove e.g. a paradox. A more profound (meta-) language needs to be constructed in order to conceive the truth of this paradoxical statement. By understanding the deeper truth of this paradoxical statement nonlocality becomes localized. [The Journal Of American Science. 2007;3(4):68-71]. (ISSN: 1545-1003).

Key words: nonlocality; Gödel; paradox; meta-language; meta-physics; universal truth;

Introduction: As science has entered the twenty-first century, nonlocality has become more or less accepted and Einstein's accusing finger pointing at quantum mechanics slowly starts making a turnaround by questioning the theory of relativity. Nicolas Gisin reflects on this in his article "Can relativity be considered complete?" as he writes in the conclusion: "Well, if nonlocality is really real, as widely supported by the accounts summaries [sic] in this article, then all complete theories should have a place for it. Hence, the question is: "Does relativity hold a place for non-signalling nonlocal correlations?""[1] This was strangely enough already demonstrated in 1918 by Albert Einstein. In his writing "dialog about objections against the theory of relativity"[2] one can read how Einstein uses the aid of an appearing and disappearing homogenous gravitational field to describe the proceedings related to an accelerated coordinate system K' (below the diagrams, column "K' is the reference frame" in section 1, 3 and 5). Einstein leaves it unmentioned that these gravitational fields have to appear and disappear everywhere at the same time, but this was clarified later by others. Geoffrey Builder (1957) writes: "The concept of such a field is completely incompatible with the limited value c for all velocities [...], so that the specified field would have to be created simultaneously at all points in S' and be destroyed simultaneously at all points in S0. Thus the principle of equivalence can contribute nothing of physical significance to the analysis."[3] This can now be seen in a different light as we realise that the appearing effect of such a gravitational field fits the description of a non-signalling nonlocal correlation and the whole analysis needs a more profound examination instead of being discarded on the grounds of a limited value c.

Albert Einstein must have been aware of the dilemma that was hiding behind his explanation as he writes further on in his dialog: "Critic: […] How are we supposed to believe that a merely fictitious field could have such an influence on the pace of a clock? Relativist: […] This consideration makes it clear that a complete clarification of the questions you have raised can only be attained if one envisions for the geometric-mechanical constitution of the Universe a representation that complies with the theory. I have attempted to do so last year, and I have reached a conception that - to my mind - is completely satisfactory; going into this would however take us too far." Einstein's completely satisfying conception has (as far as can be retraced) failed to appear and after Einstein passed away the case became more or less closed by Builder's article when nonlocality was still unaccepted.

This article goes back to the year 1918 when Einstein was at the peak of his career after having made major contributions to the theory of relativity and science in general. His profound understanding of relativity (reflected in his written dialog) will be combined with Kurt Gödel's expertise on mathematical logic and the quantum revelation of nonlocality. The results of the three most fundamental scientific discoveries of the twentieth century (relativity theory, quantum mechanics and incompleteness theorem) will be synthesized in order to see if a more profound understanding of the Universe can be achieved.

Methodology: A consistent (superficial) language will be constructed in order to be able to describe the theory of relativity. This superficial language is the normal language though it is disciplined with the purpose of maintaining consistency. One of the disciplines is to avoid the use of the word "not" and its derivatives like "nothing", "nowhere", "never", etc. This is necessary because the superficial language is incomplete and this way it remains consistent. Instead of using the word "not" the prefixes "un-", "in-", "il-", "im-", etc. are used to define the opposite or reverse, for example, unsimultaneous.

The incompleteness of the superficial language will be described by a meta-language. This meta-language only consists of words starting with "non~" for example, non~selfishness. It is impossible to define the meaning of this word within the superficial language and its meaning can only be indicated by creating a paradox. Examples of such paradoxes are: selfishness without selfishness, unselfishness without unselfishness, unselfish selfishness and selfish unselfishness. All these descriptions indicate a more profound truth which can be realised if one pictures a mother feeding her young, making all four paradoxes understandable. This example is completely unscientific but it uses awareness of a more profound truth to illustrate how a paradox in the superficial language can actually point out to this deeper truth, which otherwise would be impossible to signify with either "selfishness" or "unselfishness". If one is unaware of this more profound truth indicated by the paradox, all that will appear is a contradiction making "nonsense". One must therefore realise that the paradox created in the superficial language only values as an indicator and refrains from giving a true description of non~selfishness within the superficial language. In the same manner it can be realised that all understanding of non~locality is based on thoughts shaped by the superficial language and is therefore science fiction. One has to take a step backwards and avoid being sidetracked by the fantasy of understanding non~locality, because the thoughts that found this understanding are based on inconsistent reasoning. The discipline of unthinking these thoughts is necessary to maintain the strictness of consistent reasoning within the superficial language. Whether awareness can ultimately conceive non~locality remains undiscussed within this article. The word "non" is chosen to formulate this meta-language because of its meaning: "absence of something rather than the opposite or reverse of it." This aspect is demonstrated in the case of the word "non-logical" which differs from "illogical". The "~" is used to make it extra clear that the word refers to the meta-language instead of the superficial language.

This way the words local, unlocal and non~local become logically consistent and the current ambiguity that lies within the word "nonlocal" is avoided in an intelligent way; signalling nonlocal correlations are unlocal correlations and non-signalling nonlocal correlations are non~local correlations. The word "nonlocal" is now made redundant.

Discussion: The EPR paradox and the twin paradox are both paradoxes in which Albert Einstein played an important role. The twin paradox challenged the theory of relativity and Einstein was left explaining how it is possible for two identical clocks to show different elapsed time when taking different paths. Einstein explains (in his 1918 written dialog) that a homogenous gravitational field appears for the "spaceship twin" when accelerating backwards. The effect of this gravitational field compensates exactly enough to clear up the paradox. If one calls the spaceship twin Alice and the Earth twin Bob the following occurs; as soon as Alice pushes the button to activate the rockets for her return journey Bob's clock will go relatively faster compared to Alice's clock. When Alice pushes the button it affects Bob's clock in the instant moment. It is impossible for Bob though to notice anything of this effect in that instant moment.

In quantum mechanics exactly the same kind of event occurs as pointed out by the EPR trio. When Alice "pushes the button" (to make a measurement on her particle) it affects Bob's particle in the instant moment. It is impossible for Bob though to notice anything of this effect in that instant moment. This is what Einstein called "spooky action at a distance".

It is strange to realise that the man who criticised quantum mechanics for all of his life, partly because of the spooky action at a distance, was in fact also the first person to come up with the spooky action. Niels Bohr missed a beautiful opportunity here. Instead of defending quantum mechanics against the EPR paradox he could have mirrored the paradox upon the theory of relativity. Einstein would have been left with the following dichotomy: Either

1. The result of an acceleration performed locally at part **A** by an object has an unlocal effect on the physical reality of a distant object at part **B**, in the sense that the theory of relativity can completely predict the outcomes of this unlocal effect acting on **B**, or
2. The theory of relativity is incomplete in the sense that some element of the physical reality corresponding to **B** is unaccounted for by the theory of relativity (that is, some extra variable is needed to account for it.)

This mirrored EPR paradox can be solved with the aid of Gödel's incompleteness theorem. Kurt Gödel proved his incompleteness theorem for a particular logical system, but commented in the introduction to his proof that it could be used for almost any logical system. Gödel's incompleteness theorem shows that within a logical system, there exist certain clear-cut statements which are impossible to prove or disprove. The truth of such a statement reveals the incompleteness of the logical system and is often referred to as "the Gödel sentence". [4][5][6]

The theory of relativity can also be seen as a logical system which is "embedded" in the Universe. One can try to understand the Universe in terms of relative truths that are described by the theory, but even a complete understanding of this will still be incomplete. In order to attain a more profound understanding of the Universe one can apply Gödel's incompleteness theorem to the theory of relativity. This is done by constructing a Gödel sentence that will reveal a truth which can only be realised from a universal viewpoint.

The Gödel sentence for the theory of relativity is: "The Principle of local action [7] acts unlocally." It is impossible for the theory of relativity to either prove or disprove this statement, because the truth of this statement is indefinable within relativity. The way of the Universe is therefore more profound than the rules and axioms of the theory of relativity. This paradox reveals the incompleteness of the system and indicates a more profound truth called non~locality. This non~locality is of course the same kind as the "nonlocality" revealed by quantum mechanics. It can now be understood that there exists a universal truth called non~locality.

The mirrored EPR paradox observes the theory of relativity from a universal viewpoint and reveals locally an unlocal effect created by a homogeneous gravitational field. This locally appearing unlocal effect is only realised if one possesses a "birds-eye view" or in this case a "universal-eye view" while zapping between different coordinate systems. One can now understand that this effect is a consequence of a universal truth called non~locality, which can be revealed by applying the incompleteness theorem to the theory of relativity. The theory of relativity gives in this respect a complete prediction of the outcomes and an incomplete understanding of the Universe, while non~locality being a universal truth.

There are more Gödel sentences for the theory of relativity, each one indicating a universal truth with its particular paradox. Examples that have already been pointed out are: "simultaneous occurrences occur unsimultaneously" revealing non~simultaneity and "coordinate systems coordinate unsystematically" revealing non~systematisation also known as "non-aether" (non~aether). These two examples have already been integrated with relativity while non~locality lies patiently awaiting to be welcomed.

There are more ways to demonstrate that something spooky is going on within relativity. One of them is by analysing the symmetry of framework on which special- and general relativity are based. Both of them use the principle of equivalence which leads in both cases to a paradox. Herbert Dingle challenged this paradox in the case of special relativity, but his argument was overthrown by the consistency of the calculations. [8][9] Geoffrey Builder pointed out the paradox within general relativity, but in his case the consistency of the calculations are seen as unreal and the argument is accepted, while this paradox is encountered as a real contradiction. Special relativity enhances the non~aether with non~simultaneity, while general relativity is obstructed in doing any "non~" contribution and is conceived as an empty shell with a contradiction attached. Occam's razor is welcome to chop the special layer, but is still prevented from slashing the general shield.

It is a clear-cut case and science has a lot to answer for. Therefore the question: "Can relativity be considered consistent?" has to wait and the following question needs answering first: "When will relativity be considered with consistent reasoning?"

Conclusion: The whole nature of the theory of relativity is consistent reasoning. Kurt Gödel demonstrated that consistent reasoning within a logical system unfolds a paradoxical statement for this system which indicates a more profound truth. If the Universe is ruled by the principle of local action then this principle must rule everywhere simultaneously and therefore this principle must be acting unlocally. It may thus be concluded that the principle of local action acts unlocally. Although this statement appears to be "nonsense" it is "important nonsense" because it is non~sense. Whether consistent reasoning can ultimately conceive the way of the Universe remains to be seen. One thing though is sure; a paradox can be a gateway towards a more profound truth.

Disclaimer: This article disclaims describing the truthful truth. The purpose of this article is to demonstrate through consistent reasoning within a logical system (relativity theory) the existence of nonlocality (non~locality) by creating a meta-language. This meta-language is in itself again either inconsistent or incomplete. The article chooses for completeness in order to give a clear presentation of non~locality and therefore creates inconsistency. This is demonstrated for example in the following sentence: "It can now be understood that there exists a universal truth called non~locality." As soon as non~locality is understood it is added to the logical system as truth (universal but true) and existing, creating a bigger logical system. When non~locality is localized, the meta-language becomes contained by complete understanding while consistency twists and collapses.

If one decides to maintain consistency instead, this sentence would be as follows: "It can now be understood that there non~exists a non~truth called non~locality." With consistent reasoning the following Gödel sentence can then be constructed within the meta-language: "Non~local action acts un-non~locally." revealing that the way of the Universe is even more profound than described by the meta-language. This paradox indicates a truth called non~non~locality which demands an even more profound meta-meta-language. This meta-meta-language is in itself again either inconsistent or incomplete. This shows that consistent reasoning gets twisted by incompleteness and that each step forward is warped into a loop, while the problem persists. The universal truth keeps on slipping away from truth into non~truth and then into non~non~truth etc. being always one step ahead of its seeker.

This dilemma is clearly demonstrated by Gödel's incompleteness theorem, which can also be stated as follows: "The realisation that suits understanding is inconsistent or incomplete." The ultimate question therefore remains untouched: "How can the seeker of truth bypass this twisting contraption?"

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