

Magic rabbits in physics and unspooky violation of Bell's inequality using rabbits and doors

Extending the thought experiment considered in 'Explaining why 'unspooky' violation of Bell's inequalities is to be expected'. Looking at how the statistical pattern of matched detection is formed for 'entangled' photon pairs encountering polarizers with different angles between their orientations. By using a thought experiment analogy to help with conceptualizing unseen absolute orientations and relations between them. Correcting the description for 45 degree angle of difference between the orientation of the doors, incorrectly described in 'The trouble with magic rabbits.' Starting by considering some useful analogy and its shortcoming, and the requirements for a model to agree with experimental findings. The necessary background metaphysical environment in which the physics is happening is given. Schrödinger's cat and Many worlds are mentioned briefly. A possible simplified demonstration is outlined and evaluated. There is additional method added that was absent from 'The trouble with magic rabbits'.

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Magic rabbits in physics

Finding the outcome measurement of particle and test apparatus encounter is not quite like pulling a 'magic' existing rabbit from a hat. Similarities and differences can be explored.

Such a rabbit must be in the hat prior to extraction. Its being present in the hat, but its presence being unknown to the audience is the crux of the magic rabbit illusion.

The rabbit inside hat lining is not detected by the audience. Therefore their **observer's model universe does not include the rabbit being in the hat**. Though the existential rabbit has since birth always existed within in the pattern of all that is uni-temporally existing which is the noumenal 'Object' universe.

The rabbit is extracted. Hey pesto!

The rabbit is perceived. (The members of the audience have each formed an observation product with semblance of a rabbit, using the EM radiation they have received) Presence of an existential rabbit in the local universe needs adding to the observer's conceptual model of the universe.

That's the art of illusion.

Rabbit identifying token or term suddenly appears in the model.

This can be used as an analogy for particle measurement outcomes, knowledge about the particles, suddenly appearing in model replacing prior unknowns.

The particles existed in absolute but unknown relation to the other existing things in the environment prior to measurement. Like the rabbit concealed in the hat, unknown by the audience.

The measurement outcome term is something new that didn't exist in the universe before measurement.

In that way it is unlike the extracted rabbit and more like a Polaroid photo taken of the rabbit still inside the hat. The photo is a new product. The audience members visual semblance of a rabbit too is a new observation product (not the existential rabbit itself -but this is more obscure, less obvious.)

There is an existing rabbit to show after extraction. It is not made in-accessible by extraction.

Measurement of a particles can make the particles no longer free and detectable. Rather than destroying the rabbit at extraction, it would be better to release it into a large warren of rabbits from which it can not be identified and extracted for retesting. Analogy for absorption of the particle into the material of the apparatus.

Measurement outcomes resulting from differences of physical form or innate behaviours relating to rabbit temperament do not provide good analogies for particle experiments. The particles are assumed to be uniform in physical form and innate behavioural proclivity.

In a uni-temporal existential reality, a premise of this explanation, there is no after extraction, or after test, state prior to rabbit extraction or particle test happening. There is not a prior to extraction (or test) post extraction (or test) observation product in the universe. (Unlike in the space time continuum model.) That does not mean there is no existing, rabbit in noumenal Object reality.

A prediction of what the result would be if measured is not an observation product. The prediction depends upon there being an existing rabbit of a like pair (or opposites pair). The observation product depends on the relation formed between existential rabbit and existential door when they meet.

“In a relativistic spacetime, events at spacelike separation are taken to have no temporal order. Any system of coordinates will assign time coordinates to each of any pair of events, but, if the events are spacelike separated, the time coordinates assigned to a pair of events at spacelike separation will differ in their ordering, depending on which reference frame is being employed. If we take all of these reference frames to be physically on a par, it must be concluded that there is no temporal order between the events, as relations that are not relativistically invariant have no physical significance”.
[1.]

The issue of non simultaneity of same events seen by different observers is not relevant to the relation of existing rabbit and door or existing particle and apparatus. As they, the existing entities, are not within space-time but exist unseen within absolute uni-temporal space.

Space-time is relevant to observation products which are categorically different from things that are existing independent of observation.

When and where things happen, and the absolute relations between existing things in uni-temporal space is unknown but they are unitary and unambiguous, as there is only one time to be existing at, Uni-temporal Now.

The result not found-where does it go? It is never produced, so can't go /be anywhere. Occam's razor casts doubt (a great deal) upon a 'Many worlds' multiverse explanation.

Basketball

Basket (scores) only come into being as the ball is thrown though the hoop) Failure to make a basket score might be noted. They too only come into being as the ball is thrown, but missing the hoop. Basket scores are not basket balls coming into being. The existential ball isn't really in a goes through and doesn't go through state prior to being thrown and a relation to hoop being established.

Schrödinger's cat

Cat encountering poison is like basket ball going through hoop; The existential relationship outcome. Opening the box and noting the condition of the animal is like writing on the score card. The score-

like, state outcome has come into existence upon box opening, preceded by the existential condition of the animal.

Showing ‘unspooky’ violation of Bell’s inequalities is to be expected.

Getting the experimental rabbits behaving as they should

Why rabbits and doorways

To be clear rabbits and movable walkways are representing photon polarization and movable doorways represent polarizers with changeable orientation. For facilitation of visualization of the coming together of polarizer and wave component of a photon and what will occur. For some people the analogy will be helpful for others an unnecessary layer of abstraction. It should be remembered what the rabbits and doors represent as this will not be constantly re-iterated for readability and brevity.



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Rabbits and doorways. The basic apparatus

Set up similar to the doorways used in the paper called ‘The unspooky violation of Bell’s inequalities’, but a suitable size for rabbits. Rectangular doorways are fixed into movable walls, allowing the door to be rotated. Rabbits are set moving in opposite directions, along fenced pathway to door from central point. A pair of rabbits are used in this way for each test. A movable barricade behind each rabbit, (or assistant’s hand) can be used to prevent rabbits retracing path back to center.

Rabbits in space

Existential rabbit and existential doorway have an absolute orientation. Which is their unmeasured and unknown spatial orientation relation to all other existing things in the environment. How it appears to, the observation product generated by, an astronaut observer is a relative viewpoint.

(How can absolute orientation relate to, what is considered by mainstream physics, a point-like photon particle? There is a wave component associated with a photon that can account for wave like behavior. That wave can have an absolute orientation.)

What is important for a rabbit getting through a doorway is the relation between their absolute orientation, (rabbit-door), upon meeting.

Imagine now the pathway the rabbits are on is fully rotate-able independent of the doorways. Lets say this is a blind test and the result noting experimenter doesn't know anything about the rabbits being used. He only hears a noise such as a beep as a sensor in the floor is activated, or jingle bells being rung as rabbit passes by them upon entering the room beyond the doorway. Representing only knowing the outcome of particle test, and not the condition of the particle before testing. A practicality, an attractive stimulus beyond doorway should encourage passing through. Eg. food or other rabbits.

Passes doorway, yes or no, is a score-like result added to model of the universe. It is not appearance of an existential rabbit in the universe. Likewise the particle test results are new, but they happen because of the relation of existential particle and apparatus. The particle is not becoming existentially real because of the result.

The rabbits are fitted with magnetic booties, holding them on the walkway. To prevent them floating away in zero gravity. The booties allow the rabbits take small hops or walk easily through a doorway that is *vertical relative to the orientation of the rabbit on the path*. But the magnetic force holding the rabbit boots to the pathway is too strong to allow it to jump a door turned horizontal relative to the orientation of the rabbit on the pathway. A 45 degree relative angle of doorway to rabbit on pathway, gives an obstacle intermediate between impossible and easy to negotiate. Passable 50% of the time. The closer to vertical orientation relative to rabbit on the pathway upon meeting, the easier and more likely to pass. The closer to horizontal relative orientation upon meeting the harder and less likely to pass.

Preparation of rabbits

Rabbits can be prepared to be a correlated pair.

In which case their walkways are level with each other. Meaning the rabbits approach the door at the same angle of approach. eg. Flat horizontal floors and vertical doors, or orientations giving the same relation relative to each other, allow both rabbits prepared have same orientations pass through. If both of the rabbits orientation is at 90 degrees to vertical because of a tilted walkway both will be stopped by the vertical doors.

The rabbits can be prepared as an anti correlated pair.

In which case their walkways are at 90 degrees relative to each other. A pair of rabbits prepared to be anti-correlated will both pass though 90 degree difference in orientation doors, if their own rabbit orientation is sufficiently aligned. Either going through means the other goes through. Both fail to pass through if their own orientation is sufficiently misaligned. Either not going through means the other does not go through.

Results to be expected

The following experimental conclusions must be fulfilled.

1. A pair of **same** polarization photon wave components or same orientation rabbits must give a correlated, ie **same outcome** for the **same test**, paralel polarizers or doors, as they are a similar pair. If they are a pair of **opposed** polarizations, or 90 degree difference in angle of orientation they must give an **anti-correlated** i.e. **opposite** result for a same test.

2. tests at 90 degrees to each other give 100% correlation i.e. same matched result for ‘opposed polarization, 90 degree different pairs’ and anti-correlation for similar ‘entangled’, same polarization, similar pairs. **The reverse of 1.**

On average for the 90 degree fixed relation of rabbits (photon wave component orientation) to each other , I.e. (opposed polarizations), and 45 degree set angle of doorways (polarizers) relative to each other, brought together randomly for testing: 50% of pairs have matched outcomes. The breakdown-

Two doorways, one on each pathway, at 45 degrees relative to each other, (for example a vertical door and a doorway at 45 degrees relative to it. Or a doorway at 15 degrees past vertical and a doorway at 60 degrees past vertical.), give a matched result 50% of the time. This doorway combination is encountered by rabbits that are at 90 degrees to each other if prepared as an anti-correlated pair. If in this case if one rabbit goes through easily, its orientation closely matching that of the door, the other

meets an intermediate between easy and impossible 45 degree misalignment. Gone though 50 % of times the challenge is encountered.

With equal misalignment of rabbits and their doorways both are likely to pass through but not as easily as full alignment. The challenges being 22.5 degrees rather than zero and 45 degrees, This gives an increase in matching. However Increasing the misalignment for one rabbit, decreases it for the other giving greater likelihood of a mismatch.

The collection of co-incidence of same or oppositely matched detection pairs depending upon the prepared 'entanglement' should show that the probabilities for different separation angle of doors or polarizers is not a simple linear relationship. Quantum physics experiments for 'perfect alignment of prepared particles show the graph of outcome probability against angle of difference between polarizer orientation is sinusoidal. A similar result is anticipated for variations of the analogy set out in this paper.



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An idea for a simpler try at home method

This is simulating the apparatus of the rabbit analogy.: Pairs of circular papers with a door cut in each just above the central slit pin rotation point, That are fixed so they are rotate-able over other circles on which is drawn a radius representing angle of rabbit.

Preparation of 'rabbits': One lower circle could be spun and placed unseen in a bag with lots of others treated the same. Representing random absolute orientation. When drawn out of the bag, maintaining relative orientation of the rabbit and door circles and with a protocol for placing the circle a flat surface without changing the rabbit orientation irregularly, a partner rabbit circle can be adjusted *to represent the entanglement*.

Setting angle between doors: At least one of the doors will be adjusted to give the desired angle of difference, Which door gets which rabbit is random, As is which door or doors get moved to give the desired angle. A die could be used to choose.

Trial and error adjustment of suggested apparatus and method: These could be tried and adjusted in thickness of lines and dimensions of cut outs to see if the relationship can be demonstrated, without taking the rabbits into space! I do not know the ideal door size or rabbit line thickness.

What the results mean: Amount of rabbit line visible, % of door filled, will be related to likelihood of a detection, pass-score. Perfect alignment is the door 100% filled by rabbit line. 50% filled is 50% chance of passing through.

A method for converting percentage of doorway filled by line into a detection or no detection. This can be done by drawing a ten by ten grid of 1 inch squares. Then colouring in a proportion of the squares with no particular pattern. 10% is 10 squares, 50%, 50 squares and so on. Now like pin the tail on the donkey: Bring a blindfolded assistant who hasn't seen the grid. Get them to stick their drawing pin into the paper grid. If it strikes a coloured square it counts as a detection. If un-coloured no detection.

Evaluation: Photon experiments involve vast amounts of photon pairs which can't be realistically simulated with cut outs and lines on paper. Computer simulation of the rabbit experiment or paper demonstration attempt would allow enough trials to be comparable.



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For comparison to discussion and methods described: *“The actual chance of both photons passing or being blocked by the different polarizers is $\cos^2(\theta)$ where θ is the angle between the photons.*

An angle of zero degrees means a cosine of 1 and 100% agreement, which is what we expect from the physics of optics if both polarizers are at the same angle. Similarly, an angle of 90 degrees is a cosine of zero and always produces opposite outcomes. An angle of 45 degrees is a cosine of 0.707 which, squared, is 0.5, or a 50% chance the photons will both pass or both be blocked.”[2]

Reference

[1.]Myrvold, Wayne, Marco Genovese, and Abner Shimony, "Bell's Theorem", *The Stanford Encyclopedia of Philosophy* (Fall 2021 Edition), Edward N. Zalta (ed.),
URL = [https://plato.stanford.edu/archives/fall2021/entries/bell-theorem./](https://plato.stanford.edu/archives/fall2021/entries/bell-theorem/)

[2.]Quantum Entanglement by Daniel S. Frank, MD Sep 30, 2015 Basic Science, Medical Articles, Scientific Fundamentals