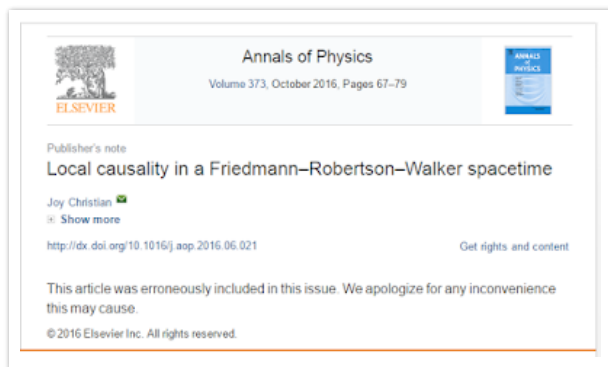


Elliptic Composability

Saturday, October 8, 2016

Local Causality in a Friedmann-Robertson-Walker Spacetime

A few days ago I learned about a controversy regarding Joy Christian's paper: [Local Causality in a Friedmann-Robertson-Walker Spacetime](#) which got published in Annals of Physics and was recently withdrawn: <http://retractionwatch.com/2016/09/30/physicist-threatens-legal-action-after-journal-mysteriously-removed-study/>



The paper repeats the same mathematically incorrect arguments of Joy Christian against Bell's theorem and has nothing to do with Friedmann-Robertson-Walker spacetime. The FRW space was only used as a trick to get the wrong referees which are not experts on Bell theorem. In particular the argument is the same as in this incorrect Joy's one-pager [preprint](#).

The mistake happens in two steps:

- a unification of two algebras into the same equation
- a subtle transition from a variable to an index in a computation mixing apples with oranges

I will run the explanation in parallel between the one-pager and the withdrawn paper because it is easier to see the mistake in the one-pager.

Step 1: One-pager Eq. 3 is the same as FRW paper Eq. 49:

$$\beta_j \beta_k = -\delta_{jk} - \epsilon_{jkl} \beta_l$$

$$L(a, \lambda) L(b, \lambda) = -a \cdot b - L(a \times b, \lambda)$$

In the FRW paper $L(a, \lambda) = \lambda I \cdot a$ while in the 1-pager: $\beta_j(\lambda) = \lambda \beta_j$ where λ is a choice of orientation. This make look as an innocuous unification but in fact it describes two distinct algebras with distinct representations.

This means that Eqs. 3/49 describe two multiplication rules (and let's call them A for apples and O for oranges). Unpacked, the multiplication rules are:

$$A_i A_j = -\delta_{jk} + \epsilon_{jkl} A_l$$

$$O_i O_j = -\delta_{jk} - \epsilon_{jkl} O_l$$

The matrix representations are:

$$A_1 = \begin{pmatrix} i & 0 \\ 0 & -i \end{pmatrix} = i\sigma_3$$

$$A_2 = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} = -i\sigma_2$$

$$A_3 = \begin{pmatrix} 0 & -i \\ -i & 0 \end{pmatrix} = -i\sigma_1$$

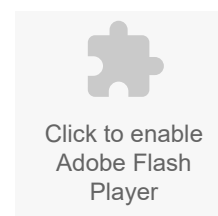
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and $O_i = -A_i = A_i^\dagger$

Try multiplying the above matrices to convince yourself that they are indeed a valid representation of the multiplication rule.

There is even a ket and bra or column and row vector representation of the two distinct algebras, but I won't go into details since it requires a math detour which will take the focus away from Joy's mistake.

Step 2: summing apples with oranges (or column vectors with row vectors)

The summation is done in steps 5-7 and 67-75. The problem is that the sum from 1 to n contains two kinds of objects apples and oranges and should be in fact broken up in two sums. If this needs to be combined into a single sum then we need to convert apples and oranges to orientation independent objects. Since $L(a, \lambda) = \lambda I \cdot a$ and $\beta_j(\lambda) = \lambda \beta_j$ with $I \cdot a$ and β_j orientation independent objects, when we convert the two kinds of objects to a single unified kind there is an additional missing factor of lambda.

Since $O_j = \beta_j(\lambda^k) = \lambda^k \beta_j$ with $\lambda^k = +1$ and $A_j = -\beta_j(\lambda^k) = \lambda^k \beta_j$ with $\lambda^k = -1$ where λ^k is the orientation of the k-th pair of particles, in the transition from 6 to 7 and 72 to 73 **in an unified sum** we are missing a λ^k factor.

Again, either break up the sum into apples and oranges (where the index k tells you which kinds of objects you are dealing with) or unify the sum and adjust it by converting it into orientation-free objects and this is done by multiplication by λ^k . If we separate the sums, they will not cancel each other out because there is -1 a conversion factor from apples to oranges $O = -A$, and if we unify the sum as Joy does in Eq. 74 the sum is not of λ^k but of $(\lambda^k)^2$ **which does not vanish**.

As it happens Joy's research program is plagued by this -1 (or missing lambda) mistake in his attempt to vanquish a cross product term. **But even if his proposal were mathematically valid it would not represent a genuine challenge to Bell's theorem.** Inspired by Joy's program, James Weatherall found a **mathematically valid example** very similar with Joy's proposal but one which does not use quaternions/Clifford algebras.

The lesson of Weatherall is that correlations must be computed using actual experimental results and the computation (like the one Joy is doing at steps 67-75) must not be made in a hypothetical space of "beables".

Now back to the paper withdrawal, the journal did not act properly: it should have notified Joy before taking action. However Joy did not act in good faith by masquerading the title to sneak it past imperfect peer review and his attempt at victimization in the comments section has no merit. In the end the paper is mathematically incorrect, has nothing to do with FRW spacetime, and (as proven by Weatherall) **Joy's program is fatally flawed and cannot get off the ground even if there were no mathematical mistakes in it.**

Posted by [Florin Moldoveanu](#) at [10/08/2016 01:24:00 AM](#)

5 comments:



Luboš Motl October 8, 2016 at 7:05 AM

It's just amazing what sort of childish deception crackpots like Joy Christian are willing to perform in order to spread their junk.

Reply

Replies



Florin Moldoveanu October 8, 2016 at 4:08 PM

Joy's address in Oxford for his "Einstein institute" is actually his home address :)



Florin Moldoveanu October 8, 2016 at 4:10 PM

This is actually a second paper he managed to publish. The first one has a rebuttal by Richard.

Luboš Motl October 9, 2016 at 3:48 AM

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onto the pa...
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for an historically
influential set of
celestial bodies, the



As I wrote on my blog, yes, I understood it was his home address. Easy to see the house on Google Maps and Street View etc.

His arXiv.org author name "Joy Christian (Oxford)" is a straight deception because it's clearly written with the purpose to make readers think that he's affiliated with the Oxford University.

It's just like the notorious "Harvard" for funds by Viktor Kožený that received the voucher booklets from millions of people in the voucher privatization. This guy - the Pirate of Prague who sometimes sends me mail about tech issues - was a student at Harvard for a while and he called his company "Harvard Funds" etc., with the clear purpose to exploit the famous brand which did work. Now he's confined in the Bahamas.



Daryl McCullough November 2, 2016 at 8:05 AM

My question about Joy Christian is whether he is a crackpot or a charlatan. Or maybe he's just too egotistical to admit he made a stupid error, and so he just doubles down and insists that he was right all along.

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Florin Moldoveanu

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