Wholistic mechanics (WM): classical mechanics extended from light-speed *c* to Planck's constant *h*.

Gordon Stewart Watson*

Abstract Against Bell (1964c), and via classical analysis (including the principle of relativity): we make quantum correlations intelligible by completing the quantum mechanical account in a classical way. We find that Bell neglects a logical correlation that refutes his theorem, while a commutation relation and some easy algebra refute his inequality. So: for Einstein—and against Bell's *naive* local realism; with certainty—relativistic causality prevails. In this way we arrive at wholistic mechanics (WM): ie, classical mechanics extended from light-speed c to Planck's constant h. Importantly, for STEM students and teachers, and against popular opinion-pieces about quantum nonlocality, our results require no knowledge of quantum theory: for the quantum is here, to be found. Let's see.

Keywords Bell's inequality, Bell's theorem, refuted, relativistic causality, wholistic mechanics, WM

1 Introduction

1.0. Einstein argued that EPR correlations 'could be made intelligible only by completing the quantum mechanical account in a classical way,' Bell (2004:86). *So we do.* In Bohmian mechanics 'an explicit causal mechanism exists whereby the disposition of one piece of apparatus affects [nonlocally] the results obtained with a distant piece.' 'I say only that you cannot get away with locality,' Bell (1964a:17), (1990:13). *But we do*.

1.1. Watson (2020F)—free-online (see References), and taken as read—is the essential preamble to this essay. Taking mathematics to be the best logic, we there show that such logic does not support Bell's inequality under β, the EPR-Bohm experiment studied by Bell (1964c).

1.2. (i) This essay shows how WM, wholistic mechanics—under relativistic causality—unites classical and quantum mechanics (and variants thereof) into one whole. (ii) In short: WM is *classical*

* eprb@me.com [Ex: 1989.v0, 2019R.v1, 2020E.v1a] Ref: 2020E.v1b

mechanics extended under the principle of *true local realism*; the union of *true* locality and *true* realism. (iii) After Einstein: true locality—our shorthand for relativistic causality—allows [concedes, admits the truth] that no causal influence propagates superluminally. (iv) After Bohr: true realism allows that some existents—Bell *beables,* in our terms—may change interactively; see Appendix II.

1.3. Closing this introduction, here's an account of extant Bellian difficulties that WM resolves:

> **p.5**: 'I cannot say that action at a distance (AAD is required in physics. But I can say that you cannot get way with no AAD. You cannot separate off what happens in one place and what happens in another. Somehow they have to be described and explained jointly.' **p.6**: 'The Einstein program fails, that's too bad for Einstein, but should we worry about that? So what? ... it might be that we have to learn to accept not so much AAD, but the inadequacy of no AAD.' **p.7**: 'And that is the dilemma. We are led by analysing this situation to admit that in somehow distant things are connected, or at least not disconnected. ... So the connections have to be very subtle, and I have told you all that I know about them.' **p.9**: 'It's my feeling that all this AAD and no AAD business will go the same way [as the ether]. But someone will come up with the answer, with a reasonable way of looking at these things. If we are lucky it will be to some big new development like the theory of relativity. Maybe someone will just point out that we were being rather silly, and it won't lead to a big new development. But anyway, I believe the questions will be resolved.' **p.10**: 'I think somebody will find a way of saying that [relativity and QM] are compatible. But I haven't seen it yet. For me it's very hard to put them together, but I think somebody will put them together, and we'll just see that my imagination was too limited.' **p.12**: 'I don't know any conception of locality that works with QM. So I think we're stuck with nonlocality.' **p.13**: '... I step back from asserting that there is AAD, and I say only that you cannot get away with locality. You cannot explain things by events in their neighbourhood. But I am careful not to assert that there is AAD,' after Bell (1990); emphasis added.

2 Foundations

> 'In a complete theory there is an element corresponding to each element of reality,' EPR (1935:777). 'While we have thus shown that the wavefunction does not provide a complete description of the physical reality, we left open the question of whether or not such a description exists. We believe, however, that such a theory is possible,' EPR (1935:780).

2.1. Under β, we seek to ensure that every relevant existent is represented by a suitable symbol in our analysis. To start, let unit-vector a (b) denote the principal-axis of Alice's (Bob's) polarizer-analyzer in spacetime region S_1 (S_2). (Calling angles like (a,b)—the angle between a and b—*offsets*: a sketch of this experiment, with its symbols, can be understood in any workshop or high-school.)

2.2. Thus, akin to the line before Bell 1964c:(1): the result of measuring $\sigma_1 \cdot a$ (say A^+) is determined in S_1 by λ_1 and a, and the result of measuring $\sigma_2 \cdot b$ (say B^-)— *in the same instance*—is determined in S_2 by λ_2 and b. So, *in the same instance*, via the pairwise conservation of total angular momentum:

$$\lambda_1 + \lambda_2 = 0. \text{ Or, simplifying: let } \lambda_1 = \lambda, \text{ then } \lambda_2 = -\lambda. \tag{1}$$

2.3. (i) Then, for generality, allowing λ to be a *random* latent variable: the related marginal probabilities equal one-half. (ii) Further, with Alice's $\hat{A}$ (Bob's $\hat{A}$) an operator in S_1 (S_2), here's our *pairwise* formulation of *relativistic causality* (aka *locality* and *local causality* in Bellian terminology):

$$A^{\pm} = \hat{A}(a, \lambda \,|\, \beta) = \pm 1,\, B^{\mp} = \hat{A}(b, -\lambda \,|\, \beta) = -\hat{A}(b, \lambda \,|\, \beta) = \mp 1. \tag{2}$$

$$\text{So, in the same instance: if } a = b \text{ and } \hat{A}(a, \lambda \,|\, \beta) = 1 \equiv A^+, \text{ then } -\hat{A}(b, \lambda \,|\, \beta) = -1 \equiv B^-, \text{ etc.} \tag{3}$$

2.4. (i) We note the similarity of our (2) with Bell 1964c:(1) & (13). (ii) Further, under our (1)-(3)—ie, with no direct causation between spacelike separated events—no event in S_1 has any direct influence on any event in S_2; and vice-versa. (iii) We therefore say that the results $A^{\pm}$ and $B^{\mp}$ are *causally independent* under β: for *neither exerts any causal influence on the other*.

2.5. Equally, from (2), via the common argument λ in Alice's and Bob's operations, here's a fact that Bell neglects: results $A^{\pm}$ and $B^{\mp}$ are *logically correlated*. (We do not say *common-cause* correlated. For there are two causes *in each instance*: ie, *random* latent variable λ flies to S_1 and its anti-correlated twin $-\lambda$ flies to S_2.)

2.6. Then, to ensure that our integral is over *same-instance* lambda-pairings—and, given our operators; in case of a later need for commutation relations—we use mnemonic external brackets $\{.\}$ thus: $\{\hat{A}(a, \lambda \,|\, \beta)\hat{A}(b, \lambda \,|\, \beta)\}$. So, from (2), integrating over Λ, the space of λ:

$$E(a, b \,|\, \beta) = -\int d\lambda\, \rho(\lambda) \left\{\hat{A}(a, \lambda \,|\, \beta)\hat{A}(b, \lambda \,|\, \beta)\right\}. \tag{4}$$

3 Bell's theorem refuted

> 3.0. 'The aim of physics is to discover "the laws" of Nature governing our objectively-existing world. ... to search for the abstract mathematical description that allows us to explain and predict—in a quantitative way—the regularities observed or to be discovered in physical phenomena which exist independent of any agent,' after Kupczynski (2015:2).

3.1. To this end, we know that $E(a,b\,|\,\beta)$ in (4) is the arithmetic mean of results $\{.\}$ under β. So:

$$E(a,b\,|\,\beta)$$

$$= \int d\lambda\, \rho(\lambda)[\{(\hat{A}(a,\lambda\,|\,\beta)=1)(-\hat{A}(b,\lambda\,|\,\beta)=1)\} - \{(\hat{A}(a,\lambda\,|\,\beta)=1)(-\hat{A}(b,\lambda\,|\,\beta)=-1)\}$$
$$-\{(\hat{A}(a,\lambda\,|\,\beta)=-1)(-\hat{A}(b,\lambda\,|\,\beta)=1)\} + \{(\hat{A}(a,\lambda\,|\,\beta)=-1)(-\hat{A}(b,\lambda\,|\,\beta)=-1)\}]. \quad (5)$$

3.2. Then, from (2), the paired results in (5) are represented (respectively) by

$$A^+B^+ = 1, A^+B^- = -1, A^-B^+ = -1, A^-B^- = 1. \quad (6)$$

$$\therefore E(a,b\,|\,\beta) = P(A^+B^+\,|\,\beta) - P(A^+B^-\,|\,\beta) - P(A^-B^+\,|\,\beta) + P(A^-B^-\,|\,\beta). \quad (7)$$

3.3. Further, from §2.5, the two results in each paired result are *logically correlated.* So, via the *general* product rule from probability theory, (7) expands to

$$\begin{aligned} E(a,b\,|\,\beta) \;\; = \;\; & P(A^+\,|\,\beta)P(B^+\,|\,\beta,A^+) - P(A^+\,|\,\beta)P(B^-\,|\,\beta,A^+) \\ & -P(A^-\,|\,\beta)P(B^+\,|\,\beta,A^-) + P(A^-\,|\,\beta)P(B^-\,|\,\beta,A^-). \end{aligned} \quad (8)$$

3.4. Then, from §2.3, the marginal probabilities are $P(A^+|\,\beta) = P(A^-|\,\beta) = \frac{1}{2}$. So (8) reduces to

$$E(a,b\,|\,\beta) \;\; = \;\; \tfrac{1}{2}\left[P(B^+\,|\,\beta,A^+) - P(B^-\,|\,\beta,A^+) - P(B^+\,|\,\beta,A^-) + P(B^-\,|\,\beta,A^-)\right]. \quad (9)$$

3.5. Now, from (3), the simplest offsets are $(a,a) = (b,b) = 0$ and $(a,-a) = (-b,b) = \pi$. Thus:

If $b = a,$ then the relevant pairs are A^+B^- and A^-B^+. $\therefore E(a,a\,|\,\beta) = E(b,b\,|\,\beta) = -1.$ (10)

If $b = -a,$ then the relevant pairs are A^+B^+ and A^-B^-. $\therefore E(a,-a\,|\,\beta) = E(-b,b\,|\,\beta) = 1.$ (11)

3.6. So, to satisfy (10)-(11) conjointly—needing relevant probabilities to sum to unity; guided by the heuristics in §8; and influenced by the cosine-squared form of Étienne-Louis Malus' Law re beam-intensities (from high-school)—we propose these laws:

$$P(B^+\,|\,\beta,A^-) = P(B^-\,|\,\beta,A^+) = \cos^2\tfrac{1}{2}(a,b), P(B^+\,|\,\beta,A^+) = P(B^-\,|\,\beta,A^-) = \sin^2\tfrac{1}{2}(a,b), \text{ etc.} \quad (12)$$

3.7. Then, from (9), via the laws in (12): our result is the same as quantum theory. For:

$$E(a,b\,|\,\beta) = \tfrac{1}{2}\left[2\sin^2\tfrac{1}{2}(a,b) - 2\cos^2\tfrac{1}{2}(a,b)\right] = -\cos(a,b) = -a\cdot b. \text{ QED.} \quad (13)$$

3.8. Thus, to the extent that our laws hold: to that extent (13) is an idealized *experimental* fact. Further, consistent with quantum theory (and experimentally testable), the *logical correlation* of paired results—foreshadowed in §2.5 and hypothesized in (12)—is confirmed. [For convenience in presentation hereafter, β *may be implicit* in many steps: and may be inserted when helpful.]

3.9. Now it is Bell's theorem (BT) that (13) is not possible; see line below Bell 1964c:(3). Thus, via WM, BT is refuted. So we now turn to Bell's inequality (BI), Bell 1964c:(15). That is, having refuted BI so easily in Watson (2020F), we now refute BI, via WM, by avoiding, then exposing, Bell's error.

4 Bell's error exposed, Bell's inequality refuted

> 4.0. 'The real factual situation of the system in S_2 is independent of what is done with the system in S_1, which is spatially separated from the former,' after Einstein (1949:85). 'The direct causes (and effects) of events are nearby, and even the indirect causes (and effects) are no further away than permitted by the velocity of light,' Bell (1990a:105).

4.1. With certainty: Bell's inequality—Bell 1964c:(15)—is false; independently refuted via elementary algebra, see Watson (2020F). So, to identify the location of Bell's error, let the three unnumbered expressions below Bell 1964c:(14) be (14a), (14b), (14c).

4.2. Now (14b) leads to Bell's false 1964c:(15), which cannot flow from (14a); see Watson 2020F:(2)-(7). So Bell's error is located between (14a) and (14b). And thus—see Bell's remark below his (14b)—Bell's error must arise from his *use* of Bell 1964c:(1).

4.3. Then, to expose Bell's error, here's our common start-point: Bell 1964c:(14a) in our notation.

$$E(a,b)-E(a,c) \quad = \quad -\int d\lambda\, \rho(\lambda)[\{\hat{A}(a,\lambda)\hat{A}(b,\lambda)\}-\{\hat{A}(a,\lambda)\hat{A}(c,\lambda)\}]: \tag{14}$$

4.4. Where—from §2.6—the brackets $\{.\}$ on $\{\hat{A}(a,\lambda)\hat{A}(b,\lambda)\}$ and $\{\hat{A}(a,\lambda)\hat{A}(c,\lambda)\}$ remind us: understand the commutation-relations (if any) between the operations $\hat{A}(a,\lambda)$, $-\hat{A}(b,\lambda)$, $-\hat{A}(c,\lambda)$.

4.5. Now, from (13), the expectation over an offset is a function of that offset; eg, $E(a,b)=E(b,a)=-\cos(a,b)$. However, in general, we see no reason to expect that the product of two expectations reduces to a third expectation. So, with caution, we move on from start-point (14) using (2) and

$$\{\hat{A}(a,\lambda)\hat{A}(b,\lambda)\}^2=(\pm1)^2=1. \tag{15}$$

$$\therefore E(a,b)-E(a,c)=-\int d\lambda\, \rho(\lambda)\{\hat{A}(a,\lambda)\hat{A}(b,\lambda)\}[1-\{\hat{A}(a,\lambda)\hat{A}(b,\lambda)\}\{\hat{A}(a,\lambda)\hat{A}(c,\lambda)\}]. \tag{16}$$

$$\text{Further:}\ -1\leq\int d\lambda\, \rho(\lambda)\,\{\hat{A}(a,\lambda)\hat{A}(b,\lambda)\}\leq 1. \tag{17}$$

$$\therefore |E(a,b)-E(a,c)|\leq\int d\lambda\, \rho(\lambda)[1-\{\hat{A}(a,\lambda)\hat{A}(b,\lambda)\}\,\{\hat{A}(a,\lambda)\hat{A}(c,\lambda)\}]. \tag{18}$$

$$\text{So here's our inequality, WI:}\ |E(a,b\,|\,\beta)-E(a,c\,|\,\beta)|-1+E(a,b\,|\,\beta)E(a,c\,|\,\beta)\leq 0.\ \text{QED.} \tag{19}$$

4.6. Thus WI-(19) *is our irrefutable inequality*: to be compared with Bell's inequality, Bell 1964c:(15),

$$\text{BI:}\, |E(a,b\,|\,\beta) - E(a,c\,|\,\beta)| - 1 - E(b,c\,|\,\beta) \leq 0\,[\text{sic}]. \tag{20}$$

4.7. Thus (14)-(19) meets Watson 2020F:(2)-(7)—also see the exercise at §1.7-1.10 therein—and they agree against BI-(20). So we now seek to understand how Bell's arrives at this (already proven-false) BI-(20). One possible move is to breach the commutation relations $\{.\}$ in true (18) by using

$$\hat{A}(a,\lambda)\hat{A}(a,\lambda) = (\pm 1)^2 = 1. \tag{21}$$

$$\text{Then, from (18):}\ \ |E(a,b) - E(a,c)| - 1 \leq \textstyle\int d\lambda\, \rho(\lambda)\left[-\hat{A}(a,\lambda)\hat{A}(a,\lambda)\hat{A}(b,\lambda)\hat{A}(c,\lambda)\right]\ [\text{sic}] \tag{22}$$

$$= \textstyle\int d\lambda\, \rho(\lambda)\left[-\hat{A}(b,\lambda)\hat{A}(c,\lambda)\right] = E(b,c\,|\,\beta)\,[\text{sic}]. \tag{23}$$

4.8. Alternatively, false (20) may be derived from true (14) via

$$\hat{A}(b,\lambda)\hat{A}(b,\lambda) = (\pm 1)^2 = 1. \tag{24}$$

$$\text{Then, from (14):}\ E(a,b) - E(a,c) = -\textstyle\int d\lambda\, \rho(\lambda)\hat{A}(a,\lambda)\hat{A}(b,\lambda)[1 - \hat{A}(b,\lambda)\hat{A}(c,\lambda)]. \tag{25}$$

$$\text{So, using (17):}\, |E(a,b) - E(a,c)| - 1 \leq \textstyle\int d\lambda\, \rho(\lambda)[-\hat{A}(b,\lambda)\hat{A}(c,\lambda)] = E(b,c)\,[\text{sic}]. \tag{26}$$

4.9. So, recalling the caution expressed in §4.5: under β, operations (result-events) do not commute, *other than pairwise* within the same instance. And it is in breaching such a commutation relation that Bell arrives (under β), at his false inequality. That is: by invalidly moving from true (18), via (21), to false (23); or from true (14), via (24), to false (26).

4.10. Bell's inequality—Bell's support for his theorem—is now doubly refuted: above, and in Watson (2020F). Thus Bell's route to false (23) or false(26): falsely implies that the product of expectations over the offsets (a,b) and (a,c) can be reduced to an expectation over the offset (b,c).

4.11. However, from Einstein (1949:85); §4.0 above: 'The real factual situation of the system in S_2 is independent of what is done with the system in S_1, which is spatially separated from the former.' And the real factual situation of paired events in one instance is causally independent of pairings in other instances. For—remember; in such instances—one result is an event in S_1; the other an event in S_2.

5 WM: classical mechanics extended

> 5.0. 'Nobody knows where the boundary between the classical and quantum domain is situated. More plausible is that we'll find there is no boundary,' after Bell (2004:29-30).

5.1. (i) An early priority was to link WM with Born's (statistical) Law and the related probability distribution $|\psi|^2$. (ii) This would allow WM to work with probability waves—as an extension of classical probability theory—to analyze the double-slit experiment. (iii) Fröhner (1998), working with the Riesz-Fejér theorem (c1915), provides the essential wholistic introduction.

5.2 ‘(i) Each real, non-negative Fourier polynomial of order n can be expressed as the absolute square of a complex Fourier polynomial of at most the same order:

$$0 \leq \rho(x) \equiv \sum_{l=-n}^{n} c_l e^{ilx} = \Big|\sum_{k=0}^{n} a_k e^{ikx}\Big|^2 \equiv \big|\psi(x)\big|^2, \tag{27}$$

where the complex Fourier polynomial $\psi(x)$ is completely unrestricted, in contrast to the Fourier polynomial $\rho(x)$ which is restricted by the requirements of reality ($c_{-l} = c_l^*$) and non-negativity. (ii) Fröhner's notation ‘anticipates the rather obvious application to quantum-mechanical probability densities, ρ, and probability wave-functions, ψ, without excluding application to other inherently positive quantities such as intensities of classical energy-carrying waves. ... (iii) Fourier techniques are most convenient whenever wave or particle propagation—constrained by initial or boundary conditions—is to be described. (iv) They are especially powerful if they permit free use of Fourier expansions, unhampered by reality and non-negativity conditions. (v) Constraints (such as point-sources, diaphragms, slits, scatterers) define (together with a wave equation for the Fourier components), eigenvalue problems whose eigenfunctions are all those waves which are possible under given experimental circumstances,’ after Fröhner (1998:638).

5.3. Further, Planck's 1900 finding is (for us) an early extension of classical mechanics: thus contributing the wholeness of WM; with all consequences therefrom. So the related priority was to link WM to the Stern-Gerlach finding that the spatial orientation of angular momentum is quantized. Thus:

5.4. Flowing from results thus far, and consistent with our reliance on the conservation of total angular momentum in all the experiments studied: (i) Via EPR-Bohm in Bell (1964c), then GHZ (1989) and GHSZ (1990)—each with their spin-half particles—we find spin $s = \frac{1}{2}$ in the related laws. (ii) Then, via Aspect (2004)—with its photons—we find spin $s = 1$ in the the related laws. (iii) And all such studies are consistent with the elementary analysis given above.

5.5. A preliminary conclusion: much remains to be done; but we are surely at the end of beginning.

6 Conclusions

6.0. ‘Einstein argued that EPR correlations could be made intelligible only by completing the quantum mechanical account in a classical way,’ after Bell (2004:86). *So we did.*

6.1. We conclude: much is yet to flow from §6.0; but we are surely at the end of beginning.

6.2. We conclude that an encyclopedia—based on relativistic causality—might provide a platform for the unification of physics terms, definitions and notations: one in which 'operationalists', 'realists', etc, might see the need to rename their groups.

6.3. We conclude—re §1.3 and the account of extant Bellian difficulties—that all of them are resolved.

6.4. We conclude that all claims in the Abstract are properly supported.

6.5. We conclude that Bell's formulations of local causality—eg, Bell (1964c); Bell (1975a), aka Bell (1976)—fail under WM.

6.6. We conclude that relativity and QM (and thus relativistic causality) are compatible; against what we take to be Bell's failed attempts *at a theory based on relativistic causality.* Thus:

> "In a theory in which parameters [λ] are added to QM to determine the results of individual measurements, without changing the statistical predictions, there must be a mechanism whereby the setting of one measuring device can influence the reading of another instrument, however remote. Moreover, the signal involved must propagate instantaneously, so that such a theory could not be Lorentz invariant," Bell (1964c:199). 'Thus Bell's 1976 theorem can be restated as: (i) either causal influences are not limited to the speed of light, OR (ii) events can be correlated for no reason,' after Wiseman (2014:468).

6.7. WM limits causal influences to light-speed AND and gives *logical* reasons for event correlations.

7 Acknowledgment

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8 Appendix I: one mechanical engineer's heuristics

> 8.0. 'Without mystery; similar tests on similar things produce similar results. Indeed, given the exacting correlations that we're discussing—and thus, more so, without mystery—correlated tests on correlated things produce correlated results with certainty.' After author (GSW) to David Mermin, 3 June 1989: discussing Mermin (1988); with α—honoring Alain Aspect—now denoting the experiment therein.

8.1. Let C denote a correlation coefficient, and let latent variables $\lambda_1 + \lambda_2 = 0$. Then

$$C(\lambda_1, \lambda_2 \,|\, \alpha) = \cos 2(\lambda_1, \lambda_2) = \cos 2\pi = 1; C(a, b \,|\, \alpha) = \cos 2(a, b). \tag{28}$$

$$\therefore E(a, b \,|\, \alpha) \equiv C(\lambda_1, \lambda_2 \,|\, \alpha) C(a, b \,|\, \alpha) = \cos 2(a, b). \text{ QED.} \tag{29}$$

8.2. Or, from (1) and §1.2:

$$C(\lambda_1, \lambda_2 \,|\, \beta) = \cos(\lambda_1, \lambda_2) = \cos \pi = -1; C(a, b \,|\, \beta) = \cos(a, b). \tag{30}$$

$$\therefore E(a, b \,|\, \beta) \equiv C(\lambda_1, \lambda_2 \,|\, \beta) C(a, b \,|\, \beta) = -\cos(a, b). \text{ QED.} \tag{31}$$

8.3. Thus, *heuristically*: (i) These results deliver the certitude of WM's true local realism; see §1.2; and lead easily to the related laws. (ii) The more so since they rely on relativistic causality via Bell's hidden beables: eg, λ_1 (in S_1), λ_2 (in S_2), etc; see §4.0. (iii) So, for us *heuristically*: any claim that (29) and (31) are impossible under relativistic causality and true local realism is most likely false.

9 Appendix II: our *true* local realism vs *naive* local realism

> 9.0. After Wiseman (2015); with our edits [...] explained in the text that follows: (i) 'The world is made up of real stuff, existing in space and changing only through local interactions—this local-realism hypothesis is about the most intuitive scientific postulate imaginable,' p.649. (ii) '... [*naive*] realism (which Bell called predetermination), essentially means that measurements reveal pre-existing physical properties of the world,' p.649. (iii) 'The immediate significance of the reported experiment, however, is in hammering the final nail in the coffin of [*naive*] local realism,' p.650.

9.1. (i) Now §9.0.(i) is another way of defining our *true* local realism: see §1.2(ii)-(iv). (ii) On the other hand: §9.0.(ii) is Bell's way of defining *naive* local realism; hence our edit. (iii) For, seeking maximal generality, our *true* realism does not regard measurements as privileged interactions that reveal pristine properties. (iv) Thus, in our terms: one of the 'most intuitive scientific postulates imaginable' is untouched by Bell's naive theorizing—see also §1.3—and strengthened by our own.

9.2. Now it is often difficult to understand what is meant by the generic term *realism*; eg, see Norsen (2006). However, in our view, there's no reason to expect 'outcome-determining hidden variables' (Norsen 2006:26) to be bound by naive realism: ie, no reason to expect that such variables will be revealed after a measurement interaction.

9.3. So, seeking utmost clarity consistent with the findings here: (i) in GHZ (2000), we suggest that each of the 25 occurrences of *local realism* be read as *naive local realism*. (ii) So too, the 5 occurrences of *local realism* in Wiseman (2015). (iii) In our view, Hensen et al (2015) would be similarly improved via similar discipline. (iv) In this way we helpfully distinguish Bell's *repeatedly refuted naive* local realism from our *repeatedly reinforced true* local realism: the latter—in our view—a classical scientific postulate forever.

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