**The empty world as the null conjunction of states of affairs**

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Abstract

If possible worlds are conjunctions of states of affairs, as in David Armstrong’s combinatorial theory, then is the empty world to be thought of as the null conjunction of states of affairs? The proposal seems plausible, and has received support from David Efird, Tom Stoneham, and Armstrong himself. However, in this paper, it is argued that the proposal faces a trilemma: either it leads to the absurd conclusion that the actual world is empty; or it reduces to a familiar representation of the empty world in which the concept of a null conjunction plays no role; or it needs to make room for the null individual of certain non-classical mereologies.

1. Introduction

According to David Armstrong (1989, 1997), possible worlds are conjunctions of states of affairs that consist entirely of elements found in the actual world.[[1]](#endnote-1) Because these elements in their various combinations exhaust all the possibilities there are, Armstrong dubbed his view *Combinatorialism*. The core idea behind Combinatorialism is one that many authors have found appealing. Armstrong himself was able to trace it back to Wittgenstein, Quine, W. J. Creswell, and Brian Skyrms. When Armstrong incorporated the idea into his own theory, David Lewis called the result the theory he likes “second best after [his] own” (Lewis 2001[1986], 74n53). More recently, Ted Sider wrote that “[t]he core idea of David Armstrong’s combinatorial theory of possibility is attractive” (Sider 2005, 680).

A crucial question is which possibilities Combinatorialism permits and which ones it does not permit. Armstrong himself thought that it does not permit the possibility of an empty world, in other words, there being nothing at all. Armstrong thought this possibility excluded by the fact that an empty world is not a recombination of actual elements, that is, of actual objects, properties, and relations (Armstrong 1989, 63). After all, in an empty world there is not supposed to be anything.[[2]](#endnote-2) Moreover, relaxing the requirements for being an empty world may not help to accommodate an empty world within Armstrong’s preferred version of Combinatorialism. For example, one might suggest that an empty world is not entirely empty because at least one state of affairs obtains in it: there being nothing, or ¬∃x x=x (more on this formulation in Section 3). However, such a state of affairs is incompatible with Armstrong’s preferred version of Combinatorialism, which forbids both negative and existential states of affairs. (Again, more on this in Section 3.)

If an attractive theory like Armstrong’s implies that the empty world is not a possible world, then this is a consequence worth paying attention to. First, it could help to answer one of the most puzzling philosophical questions of all time, namely, the question of why there is something rather than nothing. After all, if we know why there *had to be* something, then we also know why there *is* something.[[3]](#endnote-3) Secondly, it may have implications for which modal logic is the right one. For example, Ethan Brauer (2022) has recently argued that the right modal logic must be weaker than **D**—hence, weaker than the popular systems **S4** and **S5**—if it can be assumed that the empty world *is* possible.[[4]](#endnote-4) That assumption must of course be dropped if Armstrong’s Combinatorialism is the right theory of possible worlds *and* if it has the aforesaid consequence.

However, according to David Efird and Tom Stoneham (2006), it is *not* a consequence of Armstrong’s theory that the empty world is impossible. They argue that, since Armstrong is happy to admit possible worlds that are *unit* conjunctions of states of affairs, there is nothing to prevent him from admitting a possible world that is the *null* conjunction of states of affairs. In their words:

‘Conjunction’ is naturally understood as the result of joining together two or more things. Armstrong [1989: 47], however, extends this natural understanding of conjunction when he allows that possible worlds can consist in the unit conjunction of a state of affairs, which he must surely do to allow for very simple possibilities, such as there being only one coloured object. If Armstrong is content to allow for unit conjunctions, which thereby extends the natural sense of ‘conjunction’, it seems mysterious why he should balk at empty, or null conjunctions, for these are well-defined in the logical theory of normal forms, where the null conjunction is just the True (Efird and Stoneham 2006, 273).

There is a lot to be said for Efird and Stoneham’s suggestion. An empty world, on the suggested understanding, is still like any other possible world that Armstrong’s view permits in being a conjunction of states of affairs. Moreover, it is a world that one can approximate by eliminating more and more elements from the actual world, which is what Armstrong took it to be, although he also thought at one point that the approximation could never be perfect (Armstrong 1989, 64).[[5]](#endnote-5) Finally, the idea of a null conjunction is familiar from logic textbooks. For example, Wilfrid Hodges (1997) and Peter Andrews (2002) both mention “the empty conjunction” for which they use the symbols “¬┴” and “t” respectively, in line with what Efird and Stoneham report in the above quotation. This observation is relevant because, as his acceptance of the unit conjunction indicates, Armstrong’s understanding of conjunction derives from the more abstract parts of logic rather than from our everyday use of the word ‘and’. But the point is not just that the concept of a null conjunction is, logically speaking, in good standing. The point is also that the null conjunction—and so, presumably, the empty world—can be “constructed” from elements given in the actual world. For, if that is the case, then the null conjunction is almost guaranteed to represent a genuine metaphysical possibility within the framework of Armstrong’s Combinatorialism. The only other major constraint on propositions representing genuine metaphysical possibilities concerns their *form*: they must be conjunctions of propositions expressed by predicate-logical sentences such as ‘Fa’ and ‘Rab’ (Armstrong 1989, 47). But the null conjunction arguably meets this condition, too, albeit in a vacuous manner.

In light of these considerations, it is not surprising that Armstrong welcomed Efird and Stoneham’s suggestion. In his words, their “paper shows convincingly… that the Combinatorialism I embrace in my 1989 book does not rule out ‘the possibility of nothing’” (Armstrong 2006, 281). However, in what follows, it will be argued that Efird and Stoneham’s suggestion faces a trilemma: either it leads to the absurd conclusion that the actual world is empty; or it reduces to a familiar representation of the empty world in which the concept of a null conjunction plays no role; or it needs to make room for the null individual of certain non-classical mereologies.

1. The null conjunction *verified*

Before one proceeds to identify the empty world with the null conjunction of states of affairs, one may want to understand why the null conjunction is commonly equated with the True. After all, what does the empty world have to do with the True? Efird and Stoneham do not say.

According to Andrews, what explains the convention to refer to the null conjunction as the True is the fact that “adding on an empty conjunction … to a conjunction … does not alter its truth, since A∧B∧t ≡ A∧B” (Andrews 2002, 48). In other words, the True can play the role of the null conjunction, since it, too, does not make a difference when added to a conjunction.

Andrews’ explanation has a question-begging flavour to it: why assume that the null conjunction does not alter the truth value of a conjunction unless one already identifies it with the True? There is an alternative explanation, however, which is less likely to invite the same objection. The explanation is that a conjunction is true if and only if all the conjuncts are true. The condition on the right-hand side is trivially satisfied if there are no conjuncts.[[6]](#endnote-6)

The general notion of conjunction obtained in this way can be linked to the general notion of intersection. Suppose we model propositions as sets of possible worlds: intuitively, the possible worlds at which these propositions are true.[[7]](#endnote-7) A conjunction of two propositions then equals the intersection of two sets of possible worlds. Such an intersection can be defined as follows:

∩S = {w∈W|∀p(p∈S→w∈p)}

where S is a set of propositions and W is a set of worlds. In words, the intersection of the propositions in S consists of all the worlds that are a member of all the propositions in S. Although my example involved two propositions, this definition of ∩S is general: it does not matter how many propositions are in S. In the case of the null conjunction, of course, S will be empty. However, if S is empty, then the condition a world w needs to satisfy to be in ∩S is vacuously satisfied. In other words, in the special case in which S is empty, ∩S = W.[[8]](#endnote-8) If W is a proposition, then it is one that, intuitively, is true at all possible worlds; in other words, it is a necessary truth.[[9]](#endnote-9) Again, we arrive at the conclusion that the null conjunction corresponds to the True.

The conclusion seems unpalatable. If the empty world—assuming for the sake of simplicity that there is only one such world—is the null conjunction of states of affairs; if the null conjunction of states of affairs is one that we can represent by means of the null conjunction of propositions; and, finally, if the null conjunction of propositions is (necessarily) true, then how can we escape the conclusion that ours is an empty world? Reduced to its essentials, the reasoning amounts to a single application of *Modus Ponens*:

|  |  |
| --- | --- |
| 1. ∧∅ → ¬∃x x=x | From the assumption that the null conjunction represents (i.e. is true only with respect to) the empty world |
| 1. ∧∅ | From the assumption that the null conjunction equals the True |
| 1. ¬∃x x=x | From 1 and 2 |

(This schematic representation of the argument also makes clear why it does not depend on the assumption that there is only one empty world: premise 1 can be based on the assumption that the null conjunction is true only with respect to empty world*s*.)

1. The null conjunction *nullified*

Perhaps the conclusion is not as unpalatable as it seems. Perhaps the actual world is both empty and non-empty. As Robert Nozick suggests in connection with a version of modal realism that (unlike the version presented in Lewis 2001[1986]) countenances empty worlds: “Why is there something rather than nothing? There isn’t. There’s both” (Nozick 1981, 130). However, here we are sliding into a different understanding of empty worlds, as (empty) side pockets of (non-empty) worlds rather than worlds in themselves. Presumably, when Armstrong denied that his theory can countenance empty worlds, and when Efird and Stoneham contradicted him, they did not have such side pockets in mind.[[10]](#endnote-10) Rather, they were thinking of a *complete* way the world might have been, a way that precludes *anything* from existing (alongside nothing). In other words, for them, a world is a totality, comprising *everything* that exists or is the case—not just within a certain region, spatiotemporal system or universe, but *absolutely*. In this (absolute) sense, there is only one actual world, and it is either empty or non-empty, depending on whether there is something—say, an individual—in the (unrestricted) domain of the quantifier.

Hence, it will not suffice to describe the empty world as one where the null conjunction of states of affairs obtains; as we have just found out, there are plenty such worlds, not all of them empty. However, perhaps the empty world is still special in being a world where the null conjunction *and only* the null conjunction of states of affairs obtains. Expanding the description of the empty world in this way is, by the way, entirely in line with Armstrong’s Combinatorialism. After all, in Armstrong’s view, worlds are not just conjunctions of states of affairs; they also include a higher-order state of affairs, a “totality fact”, to the effect that these are *all* the first-order states of affairs. In the case of an empty world, Efird and Stoneham take the totality fact to be “the second-order state of there being no first-order states of affairs” (Efird and Stoneham 2006, 278). So construed, the empty world does seem to be a rarity. As a result, it seems that the unpalatable conclusion can be avoided. One simply needs to add a totality fact to the null conjunction of states of affairs.

Efird and Stoneham do mention one possible problem with this way out, though: it seems to appeal to a *negative* state of affairs, which, as we have seen, Armstrong’s Combinatorialism forbids. However, Efird and Stoneham think Armstrong has to welcome negative states of affairs anyway; first, because all totality facts “have something negative about them” (Efird and Stoneham 2006, 278), and, secondly, because Armstrong wishes to accept the possibility of so-called “alien individuals”, that is, objects which are not identical to anything in the actual world. However, such a possibility seems to amount to a (possible) negative state of affairs, and probably an existential one as well. After all, one obvious statement of it is ⋄∃x¬@∃y x=y.

Now, if Armstrong’s Combinatorialism has to accommodate negative existential states of affairs anyway, then it seems that we could have saved ourselves the trouble of bringing in the null conjunction. For, as suggested in the beginning, we could then simply define an empty world as one in which the state of affairs of there being nothing obtains, that is, as ¬∃x x=x.

In fact, within the framework of Armstrong’s Combinatorialism, ¬∃x x=x can be regarded as *equivalent* to Efird and Stoneham’s second-order state of affairs (recall: the second-order state of affairs of there being no first-order states of affairs). For the existential quantifier in ¬∃x x=x can be taken to range over first-order states of affairs.[[11]](#endnote-11) (Note that, in Armstrong’s view, states of affairs are particulars.) In this way, one could still (in the spirit of Armstrong’s Combinatorialism) maintain a ban on negative *first*-order states of affairs; in other words, the proposal does not open the floodgates. Even if the quantifier ranged over first-order objects only (what Armstrong calls “individuals”), ¬∃x x=x would rule out the existence of first-order states of affairs as well, since first-order states of affairs require first-order objects. Hence, ¬∃x x=x implies that Efird and Stoneham’s second-order state of affairs obtains.

The reverse is also true. If Efird and Stoneham’s second-order state of affairs obtains, then there are no first-order states of affairs, which implies that there are no first-order objects. After all, in Armstrong’s view, first-order objects cannot exist independently of first-order states of affairs (Armstrong 1989, 43).

As a result, we do not seem to have ended up with two conceptions of the empty world, but simply with two equivalent formulations of one and the same conception: one formal (“¬∃x x=x”) and one informal (“there are no first-order states of affairs”). Meanwhile, the null conjunction seems to have quietly slipped out of the picture, since neither formulation mentions it. This is surprising because, initially, it was supposed to be the key to accommodating the empty world within Armstrong’s framework. More precisely, it was supposed to enable us to think of the empty world as “constructed” from actual elements. But now it turns out that the empty world can be constructed from altogether different elements: roughly, the elements that correspond to a negative existential statement.

It might be granted that the null conjunction is dispensable in principle, but could it not be useful in allowing for a uniform, and so aesthetically appealing, treatment of possible worlds as conjunctions of states of affairs? In fact, we do not even need the null conjunction for that purpose. For, on the account that has just been sketched, all possible worlds *are* conjunctions of states of affairs. After all, on that account, the empty world is the unit conjunction of there being no first-order states of affairs or no first-order objects.

1. The null conjunction *reified*

Whatever may be the merits of the conception of the empty world put forward in the previous section, it does not retain Efird and Stoneham’s suggestion to think of the empty world as the null conjunction of states of affairs. As noted, the null conjunction simply drops out of the picture. One might want to bring the null conjunction back into the picture by turning it into an ultra-thin object, one that is perhaps more virtual than real, yet real enough to figure in a (real) state of affairs. For example, given Armstrong’s (1989, 1997) idea that conjunctions of states of affairs are mereological wholes, one might propose to think of the null conjunction of states of affairs as ‘the null fusion’ or its equivalent, ‘the null individual’.[[12]](#endnote-12) Reified in this way, the null conjunction could become a constituent of a second-order state of affairs like the one that Efird and Stoneham include in the empty world. In Armstrong’s terminology, the null conjunction could become an “aggregate” that bears the “totalling relation” to the property of being a first-order state of affairs (Armstrong 1997, 199). The second-order state of affairs in question could be represented as T(∧∅, S) or T(n, S), where ‘T’ stands for the totalling relation, ‘S’ for the property of being a first-order state of affairs and ‘n’ for the null individual.

What is interesting about the proposal is that it respects the letter, if not the spirit, of Armstrong’s Combinatorialism by not (explicitly) mentioning negation or the existential quantifier in the statement of the totality fact. Moreover, the connection between nothingness and the null individual (or the null fusion) is not new. For example, Graham Priest takes it as “obvious” that nothingness can be equated with the null fusion (Priest 2014, 152).[[13]](#endnote-13) Even more pertinent is the fact that Efird and Stoneham have themselves called on the null individual in a somewhat similar context, namely, in their attempt to make Lewisian modal realism compatible with the claim that there might have been nothing concrete (Efird and Stoneham 2005, 30-36). However, as Efird and Stoneham recognize, the null individual is a highly controversial posit. Classical mereology implies that it does not exist. Peter Simons, in his classic study of mereological systems, relegated the null individual to a footnote, where he calls it an “absurdity” that does not deserve serious consideration (Simons 2003[1987], 13n5). In a similar vein, David Lewis called it a “very queer thing” that “we have no good reason to believe in” (1991, 11). True, other philosophers have found the null individual useful enough to accord it a place in their theories. However, among them, there are quite a few who regard the null individual merely as a useful *fiction*—an attitude that seems hard to square with the proposal under consideration, which is to regard the null individual as a constituent of a (possible) state of affairs.[[14]](#endnote-14) Moreover, it is striking that the uses that have been found for the null individual are highly disparate,[[15]](#endnote-15) and are often tied to particular (metaphysical, semantic,…) theories. The null set, by contrast, at least serves the fundamental and widely recognized function of helping to generate the set-theoretic universe (cf. Lewis 1991, 12-13). It should not come as surprise, then, that in his recently updated survey of the literature, Achille Varzi observes that “[i]n general,… mereologists tend to side with traditional wisdom and steer clear of [the null individual] altogether” (Varzi 2019).

Of course, all this shows is that the null individual is, at present, a controversial entity; it does not follow that we should reject it. Regardless of whether the null individual will ever enjoy wider acceptance, however, Armstrong’s theory has no need for it, since (if what has been said in Section 3 is correct) it can avail itself of negative existential states of affairs instead; for example, there being no first-order objects or there being no first-order states of affairs. Even if adhering to the letter of Armstrong’s Combinatorialism makes negative existential states of affairs somewhat difficult to accept, they still seem preferable to the null individual. Note, in this connection, that Armstrong himself expressed strong reservations about a somewhat similar entity—the null *class*—even after he had given up his reservations about the empty world (Armstrong 2004, 114).

1. Conclusion

According to Efird and Stoneham, the concept of a null conjunction enables one to account for the possibility of an empty world without violating the core principles of Armstrong’s Combinatorialism. Armstrong himself agreed, despite his earlier reservations about the empty world. However, Efird and Stoneham’s suggestion faces a trilemma. If higher-order states of affairs are kept out of the account, then—problem #1—the null conjunction cannot represent the empty world. After all, the null conjunction characterises the empty world just as much as any other possible world, including the actual world. However, once reference is made to higher-order states of affairs, there is either—problem #2—no more use for the concept of a null conjunction or—problem #3—its use consists in picking out the contested null individual of certain non-classical mereologies.

Acknowledgments

This paper was read by four anonymous referees for this journal, three of whom provided comments that were helpful in revising earlier drafts. At an earlier stage, I also received helpful comments from Ethan Brauer, Leon Horsten, and Dan Marshall.

Declarations

The author has no competing interests to declare that are relevant to the content of this article.

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1. This description of Armstrong’s view is perfectly compatible with the fact that he was a fictionalist about possible worlds other than the actual world. After all, one can also be a fictionalist about nonactual human beings and, at the same time, hold that all possible human beings are animals. [↑](#endnote-ref-1)
2. Cf. “there is no way to combine elements and make nothing at all” (Lewis 2001[1986], 74n53). Armstrong also thought that, if an empty world were possible, then no other world would be accessible from it (Armstrong 1989, 64). It is not clear, however, why he thought this an unwelcome consequence. For example, Armstrong did not (at the time) think that the accessibility relation is symmetric (“at the time”, because he seems to have changed his mind in Armstrong 2004, 84-5). [↑](#endnote-ref-2)
3. Jan Heylen (2017) would probably disagree, since he rules out as “question-begging” any such deductive answer to the question of why there is something rather than nothing. There is an issue, however, of whether the notion of a question-begging answer can be captured in purely logical terms (as in Heylen 2017, 544-545). [↑](#endnote-ref-3)
4. Brauer’s proof requires another assumption (PWS), which I am inclined to reject, but which others may be willing to accept: “for any world *w* and sentence *φ*, it is true at *w* that ◊*φ* just in case it is true at *w* that there is a possible world *v* such that *φ* is true at *v*” (Brauer, 2022, 2754). [↑](#endnote-ref-4)
5. Again, this is an issue on which Armstrong has changed his mind. See Armstrong 2004, 91, where Armstrong refers sympathetically to the version of ‘the subtraction argument’ developed by Rodriguez-Pereyra 1997, and the quotation in the main text from Armstrong 2006. [↑](#endnote-ref-5)
6. In an analogous way, one can explain why the null *dis*junction is identified with the False. [↑](#endnote-ref-6)
7. Tom Stoneham (personal conversation) suggested that the null conjunction can be understood on this model. The suggestion is plausible, as some philosophers (e.g., Lewis 1989) have identified propositions with sets of possible worlds. However, since we are *modelling* propositions here we can regard the identification as an idealization. [↑](#endnote-ref-7)
8. This is just an instance of a more general principle, namely, that the intersection of an empty set of subsets of a set N is N itself. See, for example, Comtet 1974, 186, and Dugundji 1978[1966], 63. [↑](#endnote-ref-8)
9. If necessary truths are to be modelled as sets of possible worlds, then it is hard to avoid the assumption that there is a set of all possible worlds. We can sidestep the issue of whether this assumption is true. Armstrong himself thought that it is incompatible with the principles of recombination accepted by Lewis 2001[1986] and himself (Armstrong 1989, 25-30). However, the point of modelling propositions as sets of possible worlds in the main text is not to provide a picture of propositions that is accurate by Armstrong’s standards, but to provide an alternative way of understanding the identification of the null conjunction with the True. To the extent that the identification holds up under different assumptions, it can be regarded as robust. [↑](#endnote-ref-9)
10. The “side pockets” mentioned here are somewhat akin to the “local absolute absences” discussed by Roy Sorensen in his history of nothingness (Sorensen 2022, 102-115). [↑](#endnote-ref-10)
11. In this case, the quantifier cannot range over *all* states of affairs, since, if it did, then it would deny the existence of the state of affairs that it itself is supposed to represent. According to Efird and Stoneham, quantifier restrictions do not automatically make the issue of whether an empty world is possible uninteresting (2009, 226). [↑](#endnote-ref-11)
12. The null individual can be identified with the null fusion. See Cotnoir and Varzi 2021 (p. 141) for a proof. It is commonly thought that the null individual, if it exists, is part of everything and, therefore (by the antisymmetry of parthood), unique. One referee for this journal asks if the null individual in the empty world is, then, both the null fusion of first-order states of affairs and the null fusion of apples. This may seem strange because the null individual seems to bear the totalling relation to the property of being a first-order state of affairs only under the first description. Friends of the null individual who find this an unwelcome consequence may consider giving up the assumption that the null individual is part of everything and, therefore, unique (as in Bunge 1966, where a different null individual is proposed for each *kind* of thing). [↑](#endnote-ref-12)
13. Filippo Casati and Naoya Fujikawa point out a problem for Priest’s identification of nothingness with the empty fusion (Casati and Fujikawa 2019, 3752). However, the problem does not arise if one replaces Priest’s definition of fusion with a different, “algebraic” one (that is, if one defines fusions in terms of least upper bounds). Casati and Fujikawa (following Weber and Cotnoir 2015) themselves prefer such a definition. There may be other reasons for Priest to replace his definition of fusion (Cotnoir 2018, 644). For a general discussion of definitions of fusion and their connection with the empty fusion, see Cotnoir and Varzi 2021, 160-174, and, especially, 165. [↑](#endnote-ref-13)
14. Cotnoir and Varzi 2021, 138n83, list seven authors who fit the description in the main text. Martin 1965 could be added to their list. Hud Hudson is also not included in the list, yet he writes, cautiously, of what the null individual “*would* be, *if* it exists” (Hudson 2006, 646; my italics). [↑](#endnote-ref-14)
15. The disparity is very clear from the uses listed in Hudson 2006, 647, and Cotnoir and Varzi 2021, 138. [↑](#endnote-ref-15)