ON THE NATURE OF POSSIBLE WORLDS

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In this paper, I will develop a theory of the ontology of possible worlds, with the aim of showing how possible worlds derive from the actual world. Ontology is the study of what is and the type of existence things have. Possible worlds semantics is an indispensable tool for modern logic, and an important methodology for contemporary ethics, metaphysics, and philosophy of mind. For deontic logic, the logic of obligation and permission, states of affairs are usually evaluated as obligatory if true in all morally acceptable (or morally ideal) worlds, and permissible if true in at least one such world. For epistemic logic, knowledge is generally modeled as what is true for an agent in all worlds which the agent epistemically accesses. Thus, the language of possible worlds is a default for clarifying formalized notions of possibility and necessity, permissibility and obligation, etc.

Even apart from formal logical systems, possible world semantics is crucial in contemporary philosophy. Saul Kripke, for example, argues that possible worlds correct a long-standing error in philosophy, which equates analytic and necessary statements.[22] He argues that some *a posteriori* statements (whose truth values are learned from experience) are necessary. One such statement is that a certain table is necessarily made of wood (made of wood in all possible worlds), if it is made out of wood at all (an *a posteriori* discovery). Likewise, David Lewis argues that the notion of an

[22] Kripke, Saul A. 1980. *Naming and Necessity*. Malden, MA: Blackwell, 100-123.

essential property is only intelligible in a framework of possible worlds, claiming that a statement is essentially true of an individual if and only if it is true of all the individual's counterparts (individuals sufficiently similar to the individual in question) in all possible worlds similar to our own.[23] Finally, Alvin Plantinga argues that possible world methodologies are useful for proving the existence of God. For Plantinga, if God exists in one possible world (if God possibly exists), then God exists in them all.[24] My point here is not to argue that one or more of these views is true (or false), but to point out that possible worlds are an indispensable tool for contemporary philosophical discussions, both formal and informal.

The origin of possible worlds theory was probably developed by Leibniz, who viewed possible worlds as ideas in the mind of God, necessarily and eternally existing conceptually but not in actuality.[25] From this infinite set of worlds, God chooses the one that is the best morally and metaphysically. For Leibniz, states of affairs in possible worlds are maximal and compossible, where two states are compossible if they are both mutually possible. For example, one cannot explain the possibility of a match lighting when struck except for it being in the presence of oxygen, lack of moisture, sufficient force to strike the match, congruence with the laws of physics, etc. In other words, possibility is global, relating to mutually possible combinations of events, laws, causal relations, etc.

While most philosophers agree with Leibniz's insight that possibility is by its nature compossibility, grounded in a global network of facts and laws, the nature of possible worlds itself is highly contentious. Some philosophers, such

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[23] Lewis, David K. 2008. *Counterfactuals*. Malden, Mass. Blackwell. 55.

[24] Plantinga, Alvin. 1974. *The Nature of Necessity.* Oxford, Clarendon Press. 22-24.

[25] Rescher, Nicholas. 1996. "Leibniz on Possible Worlds." *Studia Leibnitiana* 28 (2): 129–62.

as Edward Feser, agree with Leibniz's original theistic interpretation, and argue that possible worlds are ideas in the mind of God, ultimately identical with the divine essence.[26] In contrast, David Lewis argues that possible worlds are maximal spatiotemporal systems, which like our own world according to Lewis, are purely material systems. Although similar to our world, Lewisian worlds are causally and spatially unrelated. Lewis thus interprets "actual" as an indexical predicate (similar to "here" and "now") whose truth value is relative to the context in which it is uttered. For example, for speakers in another world W, the "actual world" refers to W, not to our world. Other philosophers accept the reality of possible worlds, but not their literal existence. For example, Robert Stalnaker holds that possible worlds are a type of abstract object: maximally consistent sets of propositions. These sets are maximal in that for every proposition p in every set S, either p or its negation is contained in S.[27] Some philosophers, such as Nelson Goodman, in contrast, argue that possible worlds are not real at all, bearing no empirical grounding or genuine intelligibility.[28]

Many theories of possible worlds, such as Stalnaker's, tend to analyze them as abstract objects, existing unrelated to our world. I call this approach, broadly, the abstract approach. Others, such as Lewis, interpret possible worlds as independent physical systems that literally exist. I call this the literal approach. Before developing my own theory, I will attempt to show how the abstract and literal approaches fail to adequately explain possible worlds.

There are several issues with Lewis's account of possible worlds. First is the issue of metapossibilities, or possi-

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[26] Feser, Edward. 2014. *Scholastic Metaphysics: A Contemporary Introduction.* Editiones Scholasticae. 44-47.
[27] Stalnaker, Robert C. 1976. "Possible Worlds." *Noûs* 10 (1).
[28] Goodman, Nelson. 1978. *Ways of Worldmaking*. Indianapolis, Ind.: Hackett. 10-15.

bilities involving multiple worlds. There are several statements covering multiple possible worlds that seem to be true, but that Lewis's account has difficulty in addressing. Take the statement "it is possible that no possible worlds exist." If possible worlds are concrete entities, this statement seems true. Translated, however, the statement turns out to be "there is at least one possible world such that no possible worlds exist," which is contradictory. Lewis could respond that the original statement is false, that it is not true to say of maximal spatiotemporal systems that they need not exist; the truth of possibility statements must be analyzed in terms of possible worlds, rather than being about possible worlds themselves. This is improbable. If maximal spatiotemporal systems exist, then they are surely contingent entities. Possible worlds, despite their size, are like other physical beings, such as chairs and telephone poles, capable of existence and nonexistence.

Lewis can retort that contingency is a modal property that only exists *within* a framework of possible worlds, and that to question the framework *itself* leads to incoherencies. While it may be useful, says Lewis, to speak of a contingent entity as one that exists in some but not all possible worlds, it makes no sense to speak of possible worlds themselves as contingent. Lewis, however, only makes this move by a special pleading. If possible worlds are material systems, composed of other material things, then there is no reason they would lack a common property physical entities naturally possess, such as contingency. It also seems obvious that we *clearly can* imagine a state of affairs without any existing maximal spatiotemporal system. If the nonexistence of a possible world is so conceivable, then there is no reason to assume its lack of contingency.[29]

[29] While I do not assume a necessary and direct overlap between conceivability and genuine possibility, conceivability counts as an important factor in determining possibility. If I can easily conceive

Additionally, Lewis does not seem able to get away from his possible worlds having modal properties (properties having to do with possibility) such as contingency, for logical reasons. The negation of our statement "it is possible that no possible world exists" is "it is necessary that at least one possible world exists. This entails that at least once possible world, W, exists in all possible worlds (by definition of necessity.) What could the latter proposition mean? It is not cogent to speak of a possible world existing within another, as they are both maximal under any Lewis's interpretation of possible worlds. Thus, by reductio, it is possible that no possible worlds exist.

Another category of metapossibility statements that is problematic for Lewis's view are sentences of the form "it is possible that unicorns do not exist in any possible worlds." This states that a contingent entity, such as a table, need not concretely exist in any spatiotemporal system whatsoever. While implausible when interpreted in other versions of possible worlds theory, this statement seems true when applied to Lewis's conception of possible worlds. Why would a physical entity, such as a unicorn, *need* to exist in any possible world? In the same way that no unicorns exist in any forest on planet earth, the same *could* be true of all forests in any spatiotemporal system. This would imply, problematically, that unicorns are metaphysically impossible. This seems straightforwardly false. While it is possible that no unicorns concretely exist in any maximal-spatiotemporal system whatsoever, this should not entail that unicorns are not *possible* in any spatio-temporal system whatsoever.

Apart from issues of metapossbility, there are epistemological issues with Lewis's theory. According to Lewis, maximal spatio-temporal systems are discrete, neither interacting nor overlapping with other worlds. This follows

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of a world without unicorns, this counts heavily in favor that unicorns are, in fact, possible.

straightforwardly from the property of maximalness that possible worlds possess, as interaction implies that worlds are part of a common whole, or larger system. Unfortunately, accessing possibilities within such a context is problematic. Unicorns are possible if there is a maximal spatio-temporal system, W, such that unicorns exist in W. The existence of W, however, seems to be an *a posteriori* claim we need to access via experience. Of course, once we have already decided that unicorns are possible, Lewis's theory simply states that W exists, and likewise for any possible world. This ignores the important issue, however, of how we ever come to grasp which states of affairs are possible or impossible. We can never empirically observe the truth makers of possibility statements (existence within a possible world) so we can never ascertain the truth of possibility statements themselves

In addition to problems of metapossibilities and epistemic access, there is the issue of theoretical simplicity. According to Lewis's theory, every possible state of affairs concretely exists in some world, including unicorns, orcs, blue tomatoes, etc. This reifies every possible entity into real entities, which violates ontological simplicity. Lewis himself responds that there are two types of simplicity, qualitative and quantitative, and only the violation of the former is problematic. Lewis states "I subscribe to the general view that quantitative parsimony is good in a philosophical or empirical hypothesis; but I recognize no presumption whatever in favor of quantitative parsimony."[30]

Although Lewis may be right to prioritize qualitative over quantitative possibility, his assertion that no presumption of quantitative parsimony can be made whatsoever is problematic. Consider a counterexample: Upon discovery of a bank robbery, one detective holds that the robbery was committed by over a thousand individuals working together.

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[30] Lewis, David K. *Counterfactuals*. Malden: Blackwell Publishing, 2008.

Another detective claims that it was committed by one individual with a gun. It seems that while they are both equally qualitatively parsimonious (neither believes that a ghost or alien robbed the bank), the second detective has a more plausible claim. If two theories explain the facts equally well, good epistemic practice greatly prefers the more quantitatively simple of the two theories. This, of course, does not form a knockdown objection to Lewis's theory, but it does constitute nontrivial *probabilistic* evidence against it.

In contrast to the literal interpretation of possible worlds, the abstract interpretation views possible worlds as real, but not concrete, entities. An example of such a view is that of Robert Stalnaker. According to Stalnaker, possible worlds are maximal consistent sets of propositions. A set is maximal if, for any proposition p, the set contains either p or its negation, -p. This, for Stalnaker, ensures that the possible world describes a *complete* way that reality could be.[31] Likewise, two propositions p and q are consistent if it is possible that p and q.[32] Accordingly, a maximal set is consistent if it contains either p or not p, but not both. Thus, Stalnaker's account takes possibility among propositions as a given, making his account, like mine, a modal primitivist position. This account has the advantage of not making possible worlds an entirely new type of abstract object. Rather, if sets and propositions are coherent and genuine features of reality, then so are possible worlds. Likewise, this allows Stalnaker to avoid Lewis's radical realism. Stalnaker does not have to admit that possible worlds *concretely* exist.

An objection to this theory comes from Lewis himself. According to Lewis, while possible worlds may certainly be *modeled* as sets of propositions, it seems they cannot be *reduced* to them.[33] This is because the actual world,

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[31] Stalnaker, Robert C. "Possible Worlds." *Noûs* 10 (1976).

[32] Ibid.

[33] Lewis, *Counterfactuals*.

while itself a possible world, is not merely a set of propositions. If I wake up at seven this morning, it is possible that I woke up at seven this morning. This entails that, in at least one possible world (this one), I woke up at seven this morning. Then, surely Lewis is right that the actual world is a possible world and yet is not a set of propositions. A related argument is that Stalnaker's approach merely changes the subject. When one makes a possibility statement regarding a concrete individual, they are making a statement *about* the concrete individual, not about sets of propositions. Propositions seem to be secondary to the facts they describe. The fact that I went to the store today seems to be ontologically prior to the proposition, "I went to the store today," even if the statement is true.

Thus, both Stalnaker and Lewis's accounts fall short. Lewis, by viewing possible worlds as concrete entities, makes them both ontologically contingent and epistemically inaccessible. Likewise, by accounting for possible worlds as concrete entities, he fails to achieve epistemic simplicity. Stalnaker, in contrast, by holding that possible worlds are merely sets of propositions, fails to account for possibilities in the actual world. Likewise, clear statements of possibility about concrete entities are interpreted as being about propositions, which seems to be a problematic change of subject.

My account balances aspects of Lewis and Stalnaker's theories. Similar to Stalnaker, I take possible worlds to be certain collections of descriptions. Unlike Stalnaker's propositions, however, descriptions must have a nonempty domain. This is the actual world. Thus, possible worlds are not purely abstract, rather, they are a function of the actual world. Like Lewis, therefore, my theory holds that possible worlds are not *merely* sets of propositions. Unlike Lewis, however, I hold that certain notions of possibility, such as the modal exclusion principle explained below, are primitive. Also unlike Lewis, I hold that the actual world is ontologically prior to any other possible worlds. "Actual", therefore, is not an indexical, but an absolute predicate.

My theory of possible worlds relies on a primitive relation, which I call modal exclusion. This two-part relation occurs when certain ways of describing the world are ruled out given other ways of describing the world. For example, the description "the ground is soaking wet" rules out the description "the ground is dry." Likewise, it also excludes the future-tense description "the ground will immediately set fire if a lit match is thrown onto it." The exclusion relation can operate on mathematical descriptions, such as "the shape is three-sided" and"the shape is four-sided." It also includes non-analytic descriptions, such as the former example of the wet ground excluding its being set on fire. The exclusion relation, as it is here the only primitive modal notion, will not be defined here. Nevertheless, informally, it captures the intuition that certain things are certain ways, and that these rules out other ways that things could be. A fundamental feature of the exclusion relation is that it is a *de re* modal notion. *Things, facts, and states of affairs,* can be described in certain ways, and these descriptions exclude other descriptions.

The exclusion relation can, therefore, be broken down into at least three separate components. The first is analytical exclusion. This occurs when a description p is analytically impossible given a description q. For example, the description "2+2=4" excludes the description "2+2=5." Another component of the exclusion description is physical impossibility. For example, in ordinary circumstances, human beings are unable to fly unaided by technology. Thus, the description "human beings fly" is excluded by some set of descriptions involving human biology. Likewise, presumably, there are metaphysical impossibilities. Thus, the description "cause precedes effect" excludes "x causes y, and y causes x." Likewise, any other form of impossibility where x and y are mutually incompatible, satisfies the informal meaning of the exclusion relation. Thus, strictly speaking, the general exclusion relation is the set of all exclusion relations in a particular domain.

Once we have the exclusion relation, we can then construct several other *de re* modal definitions:

1. A description p *entails* q iff p excludes -q.
2. Likewise, a description p is *impossible* iff it excludes q and -q (this is equivalent to it entailing q and -q).
3. A description p is *necessary* iff -p is impossible.
4. A description p is *contingent* iff p is not necessary, and if p is not impossible.
5. Two descriptions, p and q, are *compossible* or *consistent* iff p does not exclude q and q does not exclude p.
6. Two descriptions that are not compossible are inconsistent
7. We speak of all the descriptions excluded by a given proposition p as the *exclusion set* of p. Alternatively, we speak of all the descriptions entailed by a description as the *entailment set*. Additionally, we will speak of the set of all propositions that are not excluded by p as the *inclusion set* of p.
8. Take the inclusion set of S, of a description p. Subsets of S that are compossible with each other are called *coherent inclusion sets of p*. If a subset from S contains two descriptions that are inconsistent, then we call this an *incoherent inclusion set*.

Having constructed some basic modal operators from exclusion, we can begin to generate possible worlds. The first step in this process lies in *combining* descriptions. I will do this by using Nelson Goodman's mereology, the calculus of

individuals.[34] According to Goodman, individuals group together to form sums.[35] For example, for two individuals x and y, the sum of the two, x+y, is itself an individual. I will employ the same process for combining individual descriptions to create compound descriptions. The description "the house is on fire" may be coupled with, for instance, the description "firefighters arrived on the scene quickly." These descriptions should be combined as sums, not as sets. This is because two events (or in this case descriptions of events) may conflict, enforce each other, or interact in any number of meaningful ways. For example, the sum of the two descriptions surrounding the fire described earlier involves one description (the firefighters arriving early) that contradict certain features of the other description (the house being on fire). This interaction is not captured by sets, which are unordered collections.

To develop possible worlds, we take sums of descriptions, p+q…+f… and treat them as individual descriptions. We then take coherent inclusion sets as possible worlds accessible from the sum. For example, if we take the actual world, W, then a coherent inclusion set on W is a possible world. Similarly, if we want to find a possible world that is logically and mathematically possible, accessible from ours, then we take the sum of mathematical descriptions of our world, for example 2+2=4 and the Pythagorean Theorem, and take a coherent inclusion set on them. This constitutes a world that is, at the very least, logically and mathematically possible. Similarly, to form a biologically possible world, form a fusion of biological descriptions, and then take the coherent inclusion set of the sum of these descriptions.

At this point, some defense of the basic starting point of "descriptions" must be given, as opposed to "things"

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[34] Goodman, Nelson, and Geoffrey Hellman. *The Structure of Appearance*. (Dordrecht: Reidel, 1977), 12-20.
[35] Ibid.

"propositions" or "facts." Why do we not say "the thing x excludes the thing y," or "the proposition x excludes the proposition y"? The reason is that, while it is clear that we can describe the world logically, biological, etc., it is not clear that there are mathematical things, as opposed to biological things, or physical things, as opposed to chemical things, etc. While it *may* be true that there are pure mathematical things, such as platonic shapes and numbers, possessing no chemical or physical properties, my theory does not rely on their existence. Instead, it relies on the more moderate notion that, even if only one type of entity actually exists, there may be several different ways to describe such an entity. We can describe the world mathematically, even if there is not a separate category of things called numbers. The reason against using propositions is that they do not range over the actual world, unlike descriptions. This, as we noted above in addressing Stalnaker's theory, runs into the difficulty of changing the subject in regard to possible worlds.

Apart from its usefulness in defining possible worlds, the exclusion relation sheds light on certain aspects of modality. As exclusion is a relational property, modal terms, conceived in this manner, are relational. There are not simply possibilities and impossibilities, but possibilities *in respect to x* or *in respect to y.* As we have seen, both possibility and necessity are conceived in terms of exclusion, where an impossible state of affairs is excluded by every description of the world, while the opposite, necessary states of affairs, are excluded by no description of the world. This, therefore, demands an acceptance of the traditional theorem that actuality precedes possibility. There are not, in this model, possibilities or impossibilities "out there," existing in the abstract. There must always be descriptions of an actually existing world in order for those descriptions to exclude anything at all. Thus, without a basic point of reference, we cannot speak meaningfully of possibility or necessity.

Next, as descriptions are necessarily descriptions *of* some non-empty domain, this rules out certain statements

such as “at one point nothing existed” granted that “something exists now” is true. If the statement were true, then, while nothing existed at some point in the past, it would have at least been *possible* that something exists at some point in the future, since some things exist now. But possibility is defined in terms of exclusion, and exclusion operates only on descriptions of an actually existing reality. Thus, possibility itself can only be defined in the context of a non-empty domain. Therefore, given that there is a world now that currently exists, it is not possible that at one point nothing existed.

This system, unlike that of Lewis, gives a clear explanation of how humans epistemically access possible worlds. We take the world as we know it, and select our attention on certain of its features. For example, we may pay attention to its biological descriptions, its musical descriptions, its chemical descriptions, etc. While focusing on whatever subset we choose, we take only a limited set of numerous possible descriptions. Then, a sum of such descriptions forms a possible world. Cognitively, therefore, we take a certain feature of our world and ask “does this rule out that X could be true?” If not, then X forms part of a possible world. For example, if we attempt to answer the question of whether unicorns are mathematically possible, we take the sum of our knowledge regarding the mathematical world (a sum of mathematical descriptions) and attempt to analyze if these exclude descriptions of the world involving unicorns.

A result of this, is that while our world and that of, say, Charles Dickens’s writings are not the same world in all respects (assuming Oliver Twist does not exist unbeknownst to us), it *is the same mathematical world*. That is, if we take the worlds described in the writing of Charles Dickens, we are unable to differentiate these from our own if we only examine mathematical descriptions. Likewise, the world of Oliver Twist and our world are likely the same biological world as well, as, presumably, the same set of biological descriptions true in one is true in another. This helps to explain how

one world “accesses" another in a certain respect. Two worlds access each other in reference to a description P iff they are the same worlds in respect to P. Thus, a possible world is best conceived as the actual world, but in a different mode.

Thus, my theory, unlike that of Lewis and Stalnaker, allows a plethora of modal notions to be formed from one elementary relation, called exclusion. Not only can it define possibility, necessity, compossibility, etc., modal exclusion can define possible worlds as coherent inclusion sets. Possible worlds are collections of descriptions, or ways reality could be, that are not ruled out by descriptions of the actual world. It thus possesses great ontological simplicity. The theory also has the advantage that it does not leave various forms of possibility undefined. Rather, a certain world type is formed based on a certain description type. For example, a mathematically possible world is defined in terms of mathematical descriptions of the actual world, coupled with exclusion.

By relying on descriptions of the actual world, the theory allows a middleground between Lewis and Stalnaker. It avoids the issues inherent in Lewis’s concrete interpretation, such as metapossbilities. It also avoids the issue faced by Stalnaker’s view, that possibility is a property of the real world, not merely of proposition sets. My theory further allows us to draw important metaphysical and epistemological conclusions. For example, as exclusion is relational, the theory rules out possibilities existing as separate things, independently of the actual world. It also falsifies statements such as “at one point nothing existed.” Epistemically, exclusion provides a compelling model of how human beings conceive of possible scenarios. We take what we know of the world (a set of descriptions), see what statements are ruled out based on those descriptions, and then conceive of various possibilities accordingly. Thus, the theory possesses several important advantages, on the logical, metaphysical, and epistemological levels.

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