Renewing a Modal Account of Existential Dependence: Upcycling Mackie's INUS Condition for Causation.

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Contents

Abstract

Relations of existential dependence are pervasive in metaphysics and science when we inquire about the nature of objects - what they are like, and about their existence – whether or not they are. We may think wholes depend on parts, living things depend on carbon molecules and ecosystems depend on plants and animals. In some sense, the former depends for its *existence* on the latter and will not exist without that which it depends on. A traditional approach has been to appeal to modal definitions to answer the question, 'what is the relation of ontological dependence?' where the salient feature of a modal definition of ontological dependence is metaphysical necessity, such that where *x* depends on *y, x cannot exist without y.* For instance, when a composite object exists then its parts *must* exist too. This analysis has been deemed by many to be too coarse-grained, resulting in misclassified dependence relations making modal definitions incompatible with metaphysical theories that posit necessary objects or necessary connections between wholly distinct objects. One example would be a theory that says numbers necessarily exist. It can never be false that the number three exists, but when electricity exists or wooden tables exists, so does the number three. However, we do not wish to say there is dependence between the existence of these objects. Any two objects like sets that have only one member and that sole member, that always co-exist will, falsely, appear to share a mutual dependence relation between them. Many contemporary metaphysicians have instead followed Kit Fine's essential existential dependence which has required the ideological primitive of an *essence.* Then we can say that there is nothing in the essence of an object that would require say, a number for its existence. I argue that we need not follow Fine in making the heavyweight ontological commitment to essences and instead, I propose a renewed modal account of existential dependence that draws inspiration from a neglected account of causation. I argue that we can lean on the framework of causal theories in developing the formal treatment of existential dependence since both causal and existential dependence relations share in their logical/structural properties, and both are important for backing theories of explanation. From this suggestive analogy I draw between existential dependence and causation, it is my view that we should explore the INUS framework for causation produced by J. L. Mackie who claimed that causes were a necessary part of a minimally and jointly sufficient set of actual conditions. Despite the many problems this theory faces as a theory for causation, as the basis for a theory of existential dependence, the INUS account shows to be quite promising in responding to the familiar problems that beset traditional modal-existential accounts. On this view, I claim that where *x* depends on *y, y is a non-redundant part of a minimal situationally-sufficient condition for x.* By appeal to situation theory, objects do not depend on one another at the level of possible worlds where necessary connections are instantiated, and necessarily existing objects exist. On my account, the dependee is a necessary part of a situation that minimally sufficient for the existence of the dependent object.

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Introduction

Our world is a busy place. It is occupied by people, animals, and plants, and filled with everyday material objects like chairs, tables, pictures, books, flowers, pens, and cigarettes. Perhaps it even has abstracta like numbers and sets. On a common picture present throughout contemporary analytic metaphysics, these objects that embellish the world we inhabit can be neatly arranged into layers. The largest forms such as galaxies are at the top, the smallest things like quarks, nuclear forces, and bosons are at the bottom and in the middle, ordered in the same manner, are those familiar 'medium-sized dry goods' like crayons, koalas, kumquats, and campfires. Everything we find in our reality has its place in the modern-day metaphysician's *Great Chain of Being.*

In light of this view, many of the elements of our reality appear to depend, in some way, on its other elements. This gives our world both *structure* and *connection* that are widely attributed to relations of ontological dependence. Specifically, if we prioritise existence of these objects in that for one object to exist and be what it is depends on another object's existing and being what it is, then call this *existential dependence.* Recent work such as that which is found in *Reality and its Structure* by Bliss and Priest[1], has sought the answer to questions regarding the nature and structural features of dependence relations like existential dependence, grounding and metaphysical dependence, more broadly. This compilation acknowledges a great deal of assumptions we philosophers take for granted that treat reality as having a privileged shape, structured into levels or layers that run from the derivative to the (more) fundamental. Many of the assumptions tied up in the orthodoxy are entailed in two key theses. One, is the thesis that reality is structured in a way that chains of entities are no longer dependent at either the largest or smallest scale of reality. The second is that at the opposite end to which they remain 'open' or dependent, there is something(s) which is fundamental, where all chains of dependence terminate.[2] These, *hierarchy* and *fundamentality* theses, do most of the groundwork in forming a common species of

[1] Ricki Bliss and Graham Priest, eds., *Reality and its Structure* (Oxford UK: Oxford University Press, 2018).
[2] Ricki Bliss and Graham Priest, "The Geography of Fundamentality: An Overview," in *Reality and its Structure: Essays in Fundamentality*, ed. Ricki Bliss and Graham Priest (Oxford Uk: Oxford University Press, 2018). 2.

metaphysical foundationalism which claims that there exist some fundamental entities and there exist some non-fundamentals that depend on them.

It might very well be that, as suggested by Lewis, one of the key tasks of metaphysics is to describe what things there are and what relation they stand in to other things, by picking out the set of entities, properties or relations that are more fundamental than others. If, in undertaking this task, such a structure is what we expect can do the work of underpinning a great deal of our theories about the world and that structure is formed by relations of existential dependence, then it is a key task for the metaphysician to seek out what exactly that relation is like.

In this thesis I am going to propose a new modal account of existential dependence. In doing so, I will make use of some existing metaphysical resources in the hope that I may preserve the limited ontological commitments that are, I think, a salient feature of modal accounts of existential dependence. Many will be familiar with the troubling results that purely modal accounts of dependence have produced by being too course-grained and yielding results that do not fall in line with our views about hierarchy and fundamentality. Philosophers left feeling let down by the capabilities of our modal resources then, have turned to populate their ontology and/or ideology with additional primitive notions intended to overcome the typical problems that beset any standard modal approach. While I agree that existing modal accounts of existential dependence are inadequate, I will argue that it is premature to opt for one of these ontologically profligate alternatives. Rather, we have not made use of the full scope of broadly modal resources available in developing the kind of fine-grained account needed to accurately capture how things stand in existential dependence relations. I will present a framework of existential dependence that centers around that claim that we only need to look to parts of possible worlds – *situations*, as they have been called – to find what is needed, in the deepest ontological sense, to account for the existence of objects and what they depend on. It is my view that we can make correct claims about what objects depend on for their existence while being ontologically parsimonious. Moreover, it is possible and favorable to maintain an account that is neutral across ontologies allowing our theories to do the work of determining what depends on what, not the relation of existential dependence itself. Here is my strategy in forming a new account that meets these targets.

I will centre the early stages of my inquiry around the two most well-known accounts of ontological dependence in the literature that undertake an existential analysis. In chapter one, I raise the generally accepted notion of existential dependence through some paradigm cases and then, explicate this notion in terms of the traditional modal-existential presented by E.J. Lowe.[3] I explore reasons for rejecting the traditional modal formulation through two well known cases raised by Kit Fine.[4] That is, objects that necessarily exist and distinct objects that share in necessary connections. I show why these cases have led many to prefer hyperintensional accounts of existential dependence such as the essentialist account proposed by Fine, himself. Once we have explored the terrain of the *essentialist* perspective, I lodge my complaint against it: primarily, that it involves a heavy ontological price that comes with the notion of 'essence'.

In chapter two, I turn to the relation of causation. Here, I argue we find many deep structural parallels between causal dependence and existential dependence. We may also draw the analogy in terms of how causation and existential dependence relate to objective explanation. Compelled by the idea that there is a suggestive analogy between these two structuring relations, I am inclined to seek an account of causation that is appropriate in its modal resources to inspire a modal account of existential dependence. We will quickly find that counterfactual accounts are too weak for our purposes, however, I argue there is theory that has long awaited the chance to be exposed for being better suited to existential dependence than it is for causation. That account is John Mackie's INUS condition analysis of causation.[5] I unpack the INUS condition for causation, and we look at some of the primary reasons why so few found it plausible as an account of causal dependence. The problems I discuss turn out to be potentially less significant when INUS conditions are used in an account of existential dependence. This allows us to proceed with some confidence that we may give an account of existential dependence making use of the INUS condition framework.

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[3] E. J. Lowe, "Ontological Dependency," *Philosophical Papers* 23, no. 1 (1994), https://doi.org/10.1080/05568649409506409.
[4] Kit Fine, "Ontological Dependence," *Proceedings of the Aristotelian Society* 95 (1995).
[5] J. L. Mackie, "Causes and Conditions," *American Philosophical Quarterly* 2, no. 4 (1965).

Finally, in chapter three I offer just such an account of existential dependence. In the first instance, I note that a formulation of existential dependence that is in exact parallel with Mackie's, will not do. Mackie's own theory faced very similar complaints to the traditional modal formulation of existential dependence. Both accounts have generated cases we do not think are rightly described as cases of causation or existential dependence. They too coarsely construe necessary and sufficient conditions at the level of possible worlds. To overcome this, I make use of situation semantics, proposed by Barwise and Perry.[6] I make use of situations in capturing only parts of conditions that are minimally sufficient for the existence of an object. The goal of this chapter is to present a modified version of the INUS condition that makes use of situation theory to capture relations of existential dependence where one object only need be a necessary part of a sufficient situation for the existence of the object that depends on it. To close this chapter, I present reasons for welcoming situations as real partial structures that come for free with our theory of possible worlds, and for their added benefit of accommodating our intuitions about where there should be dependence relations, and where there should not.

I will present existential dependence, in this project, as a legitimate component of the broader theory of ontological dependence. This is not inconsistent with treating existential dependence as a species of ontological dependence, and there may well be many other interesting and theoretically useful relations that make up a family of those we might think of as 'building relations'.[7] Likewise, my explication of existential dependence, and the kinds of representative cases I present here, is consistent with theories that invoke relations like grounding or a broad notion of metaphysical dependence. There may well remain work for grounding to do even in the presence of the existential dependence relation as I characterize it; I don't need to take a stand on that issue for my purposes.

Importantly, I am hopeful that the arguments I present here show a way in which we can maximize our use of modal resources to which we are committed in any case, using them to handle cases that, on previous modal accounts, may have seemed incompatible with the

[6] Jon Barwise and John Perry, *Situations and Attitudes* (Cambridge, Mass: MIT Press, 1983).
[7] Karen Bennett, *Making Things Up* (Oxford UK: Oxford University Press, 2017).

assumed direction of connectedness and hierarchy. May this inquiry broaden our toolkit in the search for what our world is really like.

1. Foundations: Existential Dependence

"There appears to be a distinctively ontological sense in which one thing may be said to depend on another."

(Fine 1995, p. 269)

"'Ontological dependence' is a term of philosophical jargon which stands for a non-well delineated, rich family of properties and relations which are usually taken to be among the most fundamental ontological properties and relations."

(Correia 2008, p. 1013)

1.1 Introduction to the concept of existential dependence

There are a wide range of cases of existential dependence that illustrate its diverse application, allowing us to grasp the common idea among them. These examples may each be contentious in various respects – indeed they should be given there is controversy over the concept. Illustrative cases, however, should help us understand the meaning of the claims they involve. There are some putative examples of claims to the effect that one thing depends for its *existence* on another. A collection of such cases illustrating simple dependence relations of various degrees of generality from Fabrice Correia are presented below.[8] Some are between objects of the same category; others are dependency ties between distinct categories. They are tabulated here prior to some further commentary:

[8] Fabrice Correia, *Existential Dependence and Cognate Notions* (München: Philosophia Verlag, 2005). 44; Fabrice Correia, "Ontological Dependence," *Philosophy Compass* 3, no. 5 (2008), https://doi.org/10.1111/j.1747-9991.2008.00170.x. 1015.

Dependent	Dependee
An event, process or state of affairs	Its participants (s)
A trope	Its bearer (s)
The boundary of a body	The body (or corresponding extended object)
A hole	Its host
A temporally extended object	Its temporal parts
A non-empty set	Its members
A quantity or piece of matter	Its parts
An event	Its temporal parts
A material object e.g., a table or chair	Its constituting piece of matter
A veridical intentional state	Its objects

Again, one need not agree with these illustrative cases, but we should be clear what the claim being made in each case involves. For one, the dependent or derivative entities seem to come for free, as it were, with the existence of the things they depend on. When we have members, atoms of matter or hosts, this is at least partly sufficient for the existence of sets, material objects and holes. But what does it mean to say that in all cases like those above, an object depends 'for its existence' on another? It is thought provoking to explore a variety of ways in which we might interpret this notion. For one, we might think existential dependence relations are existence entailing. That is, perhaps it is an unmediated relation which holds only between two *existing* things such that, for example, that temporal parts exist *entails* that an event exists, for how could an event depend on its temporal parts at all, if the event did not exist? If a certain material object does not exist then there is no 'existence' to depend on the parts that would compose it. But it is not at all clear how we come to know an object's 'existence' as the relata in dependence relations so that we can truly say that it is merely object *x* that depends on object *y* and nothing else about those objects. Additionally, might we also want to be able to say something about possible dependence relations even if the relata do not exist to form relations that are actual. Instead, we might think that composite objects depend on their parts of matter for their existence as though existence is a property of some sort. To depend on something 'existentially' is to merely modify the verb 'depends'

so that we refer to the way in which something depends on another. Composite objects may depend on their parts for their existence and yet depend on something else for their colour, size or shape. I suspect this adverbial way of interpreting existential dependence does not quite capture the deep ontological sense in which one object requires the existence of another. The right interpretation is, I think, to treat the relation as holding between two states of affairs such that we can say that a set's existence depends on its member's existence or a table's existence depends on the atoms' existence. This way, there are states of affairs such as «x exists» and the state is the dependent object. We can say that 'x' is dependent because it is in the state of affairs that depends on «y exists» but this does not determine the respects in which one object depends on another. Rather, whatever way that x is or the kind of thing it is in the dependent state, depends on whatever way or kind of thing that y is in the state that is the dependee. This interpretation helps deal with the challenge of understanding objects depending merely for their existence on another, for how can we isolate *x's existence* from *that* or *how x* is when x exists? Herein, I shall assume the relata in existential dependence relations are states of affairs and make use of the double guillemet brackets, '«,»', to represent states of affairs. For instance, wherever I claim that 'x depends on y', this should be read as '«x exists» depends on «y exists»'. For a state of affairs «x exists» to obtain when «y exists» obtains, the way things are, or the possibility that has been realised, or the proposition that is true, or the structure that is had[9] by the former, requires that of the latter.

The clusters of dependence relations that I have composed below represent several distinct ways in which the relation of existential dependence is instantiated. They are categorised below only to show that there exist some thematic trends in the types of cases that we tend to recognise as existential dependence. The cases that may fall into the clusters here may appear to differ substantially, so it is important to note that what I represent here is the variety of different ways in which we encounter existential dependence relations. Here I simply want to claim that what we have is a family of relations that include rigid, generic and perhaps for some, temporal ways that the relation of existential dependence may be instantiated.

[9] David Lewis, *On the Plurality of Worlds* (USA: Blackwell Publishing, 1986). 185.

The first cluster of cases are those where for one object to exist, it requires the existence of a *specific object*.[10] The classic example of this is where non-empty sets depend on their members. It is the existence of specific members that are required for the existence of the set. The members explain the specific existence of the set, for example where {Socrates} exists *because* Socrates exists. Or, when a very specific instance of electricity existence then certain electrons will exist too. Often this kind of dependence relation is referred to as 'rigid' dependence because, for example, as when a trope rigidly depends on or rigidly necessitates its bearer then the specific bearer must exist too. Some cases of composition are cases of rigid existential dependence, for instance, where temporally extended event depends on its temporal parts, those temporal parts must be of that specific event and when the event exists, they must exist as well.

The second cluster of cases are those that capture a notion of an object's existence requiring the existence of an object *of a certain sort*, however in some cases no specific individuals matter to the dependence relation.[11] According to the Aristotelian theory of immanent universals, the existence of redness generically depends on the existence of things that are red. In a case like this, for there to be a universal property, there must be exemplars of that kind of property. Other cases of generic existential dependence may even include objects such as social entities that depend for their existence on social institutions such as where the existence of a point guard depends on the existences of a basketball team, but no particular basketball team is required. In line with contemporary discussions of physicalism, molecules, cells and chairs are all *realized* by the physical stuff of which they are made such that their existence generically depends on their physical realizers that are certain kinds of objects. The parthood relation may also be a case of generic existential dependence. Many claim that the existence of genuine wholes depend on the existence of their parts and since those wholes could exist with some substitute parts, they do not depend rigidly on their proper parts. Whether rigid or generic, we may plausibly say that the proper parthood relation is asymmetric.

[10] Correia, "Ontological Dependence." 1014.
[11] Correia, "Ontological Dependence." 1015.

Lastly, it may appear as though there is a class of existential dependence relations that we might initially think of as 'temporally relativized'. This seems initially appropriate for objects that go in and out of existence, for example, where living organisms depend on cells that change or no longer exist. We can attribute divergent views on cases like this to the difference between A- and B-theories of time, in terms of how we interpret existential dependence claims that sound temporally oriented. A-theorists will argue that for dependees that no longer exist, we cannot make true claims about things depending on them in the present. Any past dependence relation between objects for the A-theorist is now simply no longer there. Alternatively, B-theorists, who are also often perdurantists, think that facts about what exists, are permanent facts. On this view, objects exist by extending in time such that they have different temporal parts at different times at which they exist. An object and its parts do not need to exist permanently, but a fact about an object depending on its parts will not cease to be true after the parts no longer exist.[12] States of affairs like «*x* exists» and «*y* exists» are permanently related and do not require treatment as 'temporary dependence' at all. Any A-theorist will be hard pressed to argue for diachronic dependence relations since they cannot appeal relations existing in the past, whereas B-theorists may in fact argue that there are diachronic existential dependence relations. However, nothing much hangs on taking a side on this debate for our purposes here. At least in the canonical way of thinking of simple dependence claims, this is not in the sense of temporal existence. Existential dependence relations are typically synchronic so tensed talk about existential dependence might be explained if we understand existence as non-time-relative similarly to the way that it is relative to spatial location. Our colloquial talk of objects going out of existence may simply mean that their locations in a world no longer overlap any moment that is the present time or that is beyond that time. Any possibility of temporally relativized dependence should not rule out that the notion of simple existential dependence should be taken in a timeless sense where an object *x* is said to 'simply' depend on object *y* when in order for *x* to timelessly exist, *x* needs *y* to timelessly exist.[13]

[12] Dean W. Zimmerman, "The A-Theory of Time, The B-Theory of Time, and 'Taking Tense Seriously'," *Dialectica* 59, no. 4 (2005). 402-406.

[13] A particularly difficult case that arises when we think of temporally oriented existential dependence claims is that of human beings depending on their parents or biological origins. Kripke has famously discussed this example, arguing that a person's origin, being born of those parents and from that sperm and egg, are necessary

My approach in this introductory chapter is this: In section 1.2, I shall continue to clarify the notion of existential dependence in terms of applications in metaphysics and metaphysical explanations. Here I also outline why I think existential dependence stands apart from other familiar building relations such as grounding and supervenience. In section 1.3, I explore the modal-existential interpretation of existential dependence, some varieties of it (1.3.1 and 1.3.2) and then discuss cases of its well-known short-comings in sections 1.4 and 1.5. In section 1.6 and 1.7, I explore why constructions that express claims of existential dependence need to be hyperintensional and outline a well-known alternative offered by Kit Fine – essential dependence and the way in which many perceive that this definition of dependence solves the problems faced by the modal account. I address the unwanted cost of ideological primitives associated with essentialist accounts of dependence, arguing that neither essentialist nor traditional modalist offers a satisfactory definition of existential dependence.

1.2 Existential dependence clarified and distinguished from other familiar building relations

It is widely agreed upon that there is distinctively ontological sense in which one thing depends on another. There are a number of ways in which this relation has been further analysed but *existential* accounts of various kinds, are the leading accounts in the literature on ontological dependence. The sorts of things that are related in this way are typically objects such that where one object exists it depends on another object's existence and, what one object is will depend on what another object is. The relation of existential dependence is generally treated as a category-neutral relation that can potentially hold between entities of any sort. This means that the concept of existential dependence does not place any constraints

properties of that person. He claims that origin, arguably, concerns a person's identity or nature and that origin may plausibly be regarded as essential to a person, living creatures or even a particular wooden table that could not have been made from a different block of wood. This line of thinking might endorse the view that we require that which we originate from for our existence, regardless of its current existential status. Although the way cases such as this are described in terms of what these objects depend on seem modally oriented in a similar way to those cases raised in our earlier table, they are not exactly like the cases we are primarily interested in here. Cases concerning what human beings depend on should be left aside for this inquiry and treated as a generative claim or even a case of causal dependence, not synchronic existential dependence as it is being treated here.

on what sort of things can existentially depend on another; nor does the concept alone does not tell us what depends on what.[14] Any existential account of ontological dependence, broadly speaking, simply says that the requirements that must be met for an entity to exist and be as it is, involve the entity that it depends on. In this way, notions of existential dependence are often imagined to 'carve reality at its ontological joints'.[15]

Applications of existential dependence indeed claim to do a lot of important metaphysical work. One of the most important applications of existential dependence relations concerns fundamentality and the hierarchical structure of reality. Many who interpret the notion of dependence as an existential claim draw on Aristotle who, in the *Categories,* expresses the view that all entities depend on primary substances and without primary entities it would not be possible for anything else to exist.[16] From ancient thinkers like Aristotle to recent philosophical figures such as E. J. Lowe, many have thought we understand existential dependence in terms of what is *fundamental* – that which does *not* depend for its existence on anything else.[17] It has often been thought that only those objects that do not depend on anything else are those which we can claim exist, proper, since they exist non-derivatively.[18] Dependent objects and the relation of existential dependence are important in metaphysics in the study of both the nature of non-fundamental objects (in what they are) and the existence of them (in whether they are). To understand objects in these ways, we must know something about that on which they depend.[19] This connection between dependent objects that are derived from those they depend on and ultimately, derivative of something fundamental, invokes a hierarchical structure of existing objects. A prevailing view in contemporary analytic metaphysics, *metaphysical foundationalism,* entail the claim that reality is arranged in this way such that there is a hierarchy of chains of entities ordered by the relation of existential dependence. These chains terminate at a level of fundamental entities. For example, in mereology, which is the study and wholes and their parts, someone

[14] Benjamin Schnieder, "Grounding and dependence," *Synthese* 197, no. 1 (2017), https://doi.org/10.1007/s11229-017-1378-z. 98.
[15] Correia, "Ontological Dependence." 1013.
[16] Phil Corkum, "Aristotle on Ontological Dependence," *Phronesis* 53, no. 1 (2008), https://doi.org/10.1163/156852808x252594. 70.
[17] Although they use the term 'substance'.
[18] Fine, "Ontological Dependence." 269.
[19] Fine, "Ontological Dependence." 269.

who endorses mereological fundamentality will posit that the world is organised into mereological levels, with the fundamental level at one end of the mereological scale.[20] Whether the parts or the whole are at the most fundamental level, they will be existentially independent since there should be nothing else presupposed by their existence. Composite objects gain their existence by being derived from the existence of prior levels of mereological atoms.

This important role of existential dependence intersects with interesting recent theories of time that propose we can apply what we know about existential dependence to a theory of time that employs the notion of temporary fundamentals. Sam Baron has proposed that there may be fundamental objects that exist at a time but depend for their existence on prior objects that no longer exist. Baron's theory states that only present entities exist fundamentally. Past and future entities exist, but they are dependent on things that exist in the present.[21] If we suppose that electrons are physically and/or mereologically fundamental and yet lack permanent existence, then it could be that they required some previous process or interaction between entities for their existence. Despite the commitments of metaphysical foundationalism, we might still need a relation of existential dependence to bring into being those objects on which everything else depends. Baron's theory may put some pressure on the standard way of thinking about the divide between fundamental and derivative. While the relation of existential dependence itself imposes no restrictions as to what can depend on what, if we think theories like this are viable then our definition of existential dependence must place no constraints on what the dependence structure must be like. It must allow us to say that even fundamental objects engage in existential dependence relations with those objects whose being or whose interactions with one another, are required for fundamental objects to exist. Metaphysical foundationalism is a substantive metaphysics thesis that involves ontological commitments not only to an existential dependence relation but also to a realm of unexplained, independent entities. Perhaps, however, fundamental objects do not need to be independent but merely need to explain why there are dependent entities

[20] Tuomas E. Tahko, "Fundamentality and levels of reality," in *An Introduction to Metametaphysics* (Cambridge UK: Cambridge University Press, 2015). 127.
[21] Sam Baron, "The Priority of the Now," *Pacific Philosophical Quarterly* 96, no. 3 (2015), https://doi.org/10.1111/papq.12030. 329-330.

whatsoever.[22] If existential dependence is also an explanatory relation, then we can be sure that dependent entities are those that have explanations and when looking to the dependence structure of reality, explanations regarding the existence of objects do appear to be available in abundance.

Accordingly, at its very best, existential dependence promises to give us a thorough understanding of metaphysical explanation. Both metaphysical and scientific inquiry into the nature and existence of objects assumes that to be dependent is to have a non-causal explanation that is objectively pure such that it is mind-independent, not context sensitive or tied up in our understanding or our cognitive lives. Explanation is also asymmetric. Asymmetry is a structural feature that many attribute to existential dependence relations which has particular importance to the hierarchy thesis. This asymmetric structuring relation is important for many fields. In metaphysics, theories that claim that wholes depend on their parts or in contrast, that the whole is fundamental, take their position on priority ordering to support metaphysical explanations about the composition of material objects. Reductive explanations in the natural sciences presuppose that higher levels of reality are contained in the lower levels since they depend on them. For example, where a biological process of an organism is explained in terms of biochemical reaction, some may claim the biological organism depends on and is reducible to its cellular structure. Reductive explanations in science may often treat 'levels' akin to the mereological ordering of objects however, this may be better understood as the stratification of reality into processes or behaviours at different scales. At one level there is the distribution of properties of a certain system over space-time that depends on or cannot exist without the distribution of properties of another system over space-time.[23] In this way, ontologically significant 'levels' of reality are best understood non-reductively such that higher-level phenomena in physics are not always contained in lower-level phenomena. This also highlights the fact that there is no in-built reductivism in existential dependence relations. While aspects of physics may fail to be dependent on others in the way that wholes are on parts (nor is this mereological conception

[22] Ricki Bliss, "What Work the Fundamental?," *Erkenntnis* 84, no. 2 (2017), https://doi.org/10.1007/s10670-017-9962-7.
[23] Alexander Rueger and Patrick McGivern, "Hierarchies and levels of reality," *Synthese* 176, no. 3 (2010). 382.

of existential dependence built into the hierarchy thesis), there is still a role for this important structuring relation in explaining emergent or realized behaviours of physical systems.[24]

Much of what I have said so far and the cases I have presented are compatible with being formulated in terms of metaphysical grounding and some readers may prefer to formulate these cases accordingly. For example, facts about an event might be grounded in facts about the event's temporal parts, or mental states might be grounded by physical states. Often grounding and existential dependence are terms that are used interchangeably, or both are placed under the heading of 'metaphysical dependence relations.' Karen Bennett has analysed relations like grounding, composition, supervenience and existential dependence in terms of 'building relations', claiming the notion of building is central to inquiry in analytic philosophy which involves talk about what things *give rise to*, *generate*, or *make up* other things.[25] While it is true that grounding and existential dependence are structurally similar relations and both distinct from other kinds of dependence relations such as for instance causal dependence, they should not face treatment as the same or a single metaphysical dependence relation. To add to this point, since grounding talk often involves reference to propositions, I will use single angle-brackets to indicate a proposition, for example, '$\langle p \rangle$' names the proposition that p.

Where we may say that the existence of Socrates grounds the proposition ⟨Socrates exists⟩, we would not be inclined to say that the proposition ⟨Socrates exists⟩, is appropriately described as ontologically depending on the existence of Socrates. ⟨Socrates exists⟩ is true because Socrates exists, such that the truth of the proposition is grounded in the facts about existence of the relevant man.[26] According to Alvin Plantinga *Existentialism* involves the thesis that singular propositions are existentially dependent on the individuals they involve. However, it is easy to show that a proposition that has an individual such as Socrates as a constituent, is not existentially dependent on him. The argument goes along these lines: Since

[24] Although a matter of high contention, there are also arguments for mathematical application whereby explanatory relationships are grounded in dependence relations between the relevant entities. See Lange, M. (2016). Because without cause: Non-causal explanations in science and mathematics. New York: Oxford University Press; and Reutlinger, A., & Saatsi, J. (Eds.). (2018). Explanation beyond causation: Philosophical perspectives on non-causal explanations. New York: Oxford University Press.

[25] Bennett, *Making Things Up*. 1-2.

[26] This example of a case of grounding taken from Jonathan Schaffer, "Grounding in the image of causation," *Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition* 173, no. 1 (2016). 52

Socrates does not exist necessarily, it is possible that he should not exist. Two propositions follow from this, they are ⟨possibly Socrates does not exist⟩, and ⟨Socrates does not exist⟩. The former is true and the latter, possibly true. The latter proposition cannot be true unless it exists and if it did exist then Socrates would not have existed. For the proposition ⟨Socrates does not exist⟩, to be true, it would exist, yet Socrates would not and thus, the proposition would not existentially depend on the constituent, Socrates.[27] While we must reject existentialism, the proposition is, however, *grounded* in the fact that Socrates does not exist. This case suffices as good reason to suspect existential dependence and grounding are distinct since there are cases of non-uniformity among instantiation of these relations. Further support of the non-uniformity between grounding and existential dependence can be found by appealing to overdetermination in much the same way that David Lewis claimed that causation can occur without causal dependence.[28] The fact that I exist grounds the fact that something exists, however the state of «some object exists» does not depend on «I exist» obtaining since the fact that something exists is largely overgrounded by true facts about the existence of many things.

Supervenience is another familiar relation that we should note as distinct from existential dependence even though supervenience claims may generally involve the idea that the supervenient facts are in some sense 'ontologically derivative' upon the subvenient facts.[29] Supervenience is standardly understood as where a set of *A*-properties supervenes upon another set of *B*-propertie*s* just in case no two things can differ with respect to *A*-properties without also differing with respect to their *B*-properties. For instance, if you change the aesthetic properties of an artwork, you will also have to alter its physical expression, so the aesthetic properties of the artwork are ontological derivatives of and supervene on the physical properties of the artwork. However, there are important reasons for thinking these are distinct relations. For one, supervenience is generally a relation whose relata is properties or families of properties, whereas existential dependence is often a relation between objects or members of various ontological categories. Moreover, existential

[27] Alvin Plantinga, "On Existentialism," *Philosophical Studies* 44, no. 1 (1983), https://doi.org/10.1007/BF00353411. 9.
[28] David Lewis, "Causation," *The Journal of Philosophy* 70, no. 17 (1973). 567.
[29] Correia, "Ontological Dependence." 1029.

dependence is widely assumed to be irreflexive and asymmetrical whereby nothing can depend on itself, and two objects cannot mutually depend on one another. Supervenience, on the other hand, as defined above, is reflexive, and not asymmetrical. Supervenience may hold asymmetrically when, for example, there cannot be metal difference without physical differences. However, since there can be physical differences without mental differences, the physical does not supervene on the mental. But it is also true that for any set of properties A, there cannot be an A-difference without an A-difference. This is also why supervenience relations sometimes it holds symmetrically, as every reflexive case of supervenience is trivially a symmetric case. Supervenience may not even be antisymmetric - that is, the only case where A supervenes on B and B supervenes on A, is the case where $A = B$. Consider the case where non-empty sets rigidly depend on their members. This means that non-empty sets and their members cannot have independent variation in either direction such that it would seem that they symmetrically supervene on one another and remain distinct objects. Supervenience diverges from existential dependence in this case as we do not think there is symmetric dependence between sets and their members.

Like grounding, there are also clear cases of non-uniformity between supervenience and existential dependence. A supervenience claim does not entail a dependence claim. Since no two things can differ with respect to A-properties without also differing with respect to B-properties, then two things that are unrelated in an existential sense can be related by supervenience. This is especially the case with necessary and impossible properties. For instance, nothing can be both P and not P, so no to two things can differ with respect to being P, without also differing with respect to being not P. Further, Objects can have the necessary property of not being both P and not P so since this can never differ then no other property can differ with respect to it, meaning the former necessary property may supervene on any property at all that it clearly does not depend on. We might also think if we can alter some properties of objects like those that are not essential to them, without changing what an object depends on, then we will also have cases where existential dependence and supervenience come apart.

While related to existential dependence as part of a wider family of building or structuring relations, grounding and supervenience seem to be more than just an object-

relating relations. Although existential dependence can be spelled out in terms of states of affairs - as I shall discuss shortly - it is primarily a relation between objects. So, for now, we leave the distinct relations of grounding and supervenience behind and move towards a more detailed analysis of existential dependence.

Herein, I lay the groundwork for an analysis of existential dependence. Consider this a species of ontological dependence in terms of the *existential* analysis such that, for example, where there are ecosystems, they depend for their existence on the plants and animals and where there are houses and people, the existence of markets depends on them. Living things depend for their material existence on carbon atoms or their cells. We can use the terms 'dependent' and 'dependee' to signify which side of the '… depends on …' relation each of the relata is located. If x depends on y, then x is the dependent, y the dependee. For example, ecosystems are the dependent object that requires for their existence, the dependees of say, plants and animals. A traditional approach has been to analyze all forms of existential dependence in *modal* terms, involving distinctly metaphysical notions of *possibility and necessity*. In more recent times however, an analysis in terms of the notion of *essence* has surged in popularity. There are even those who pursue a different analysis of dependence altogether where there are cases of ontological dependence that may not involve a requirement for existence at all such as for instance, cases of *identity* dependence. On this view, if the identity of *x* depends on the identity of *y* then *which* thing of its kind *y* is fixes (or partly fixes) *which* thing of its kind *x* is.[30] Other non-existential accounts have included explanatory dependence – where *y explains x* or *x* exists only *because y* exists.[31] Explanatory dependence has developed rather independently of the broader considerations surrounding ontological dependence and does not amount to a suitable definition of existential dependence as it fails to clearly define an objective metaphysical relation between entities. In this chapter, my aim is to lay the foundations for a new modal definition of existential dependence. So, my primary focus here will be with accounts put forward by the *modalist* and *essentialist*. Consequently, I shall not concentrate on accounts from identity or explanation. I shall not deny that other accounts of ontological dependence such as those in

[30] E. J. Lowe, "Substance and dependence," in *The possibility of metaphysics: substance, identity, and time* (Oxford,UK: Clarendon Press, 1998). 147.
[31] See Benjamin Schnieder, "A Certain Kind of Trinity: Dependence, Substance, Explanation," *Philosophical Studies* 129, no. 2 (2006), https://doi.org/10.1007/s11098-005-4636-8. 409.

terms of explanation or identity are able to provide theoretical insights to the ontological structure of reality, however I am compelled to treat existential dependence as deserving to be the primary target in an account of ontological dependence. Here I intend to explore two existential accounts and the problems they pose for the existential analysis of ontological dependence as to prepare for the formulation of my own account in the coming chapters.

1.3 The modal-existential definition

We begin with a primary modal characterization of existential dependence that can be traced to a familiar line of thought from Hume:

> if the first object had not been, the second never had existed.[32]

Here one can detect the counterfactual claim about an object *y* that supports an object *x* or is that which *x* depends on, which states that if *y* had not existed then neither would have x.[33] Throughout, 'E' is used as the existence predicate such that for example, I will use 'Ex' indicating '*x* exists'. The existence predicate applied to an object *x* can be read synonymously with '$\exists z x = x$'. Hume's counterfactual claim applied to existing objects may be expressed as:

> *x* counterfactually depends for its existence on *y* $=_{df}$ if *y* had not existed then *x* would not have existed.

This can be formulated with the counterfactual conditional operator here:

$$(\neg Ey > \neg Ex).$$

[32] David Hume, "Section VII: Of the idea of Necessary Connection," in *An Enquiry Concerning Human Understanding* (New York, United States: Dover Publications Inc., 2004). E7.29, SBN 76-7.
[33] In the entry under 'dependence' in the Handbook of Metaphysics and Ontology (1991), Peter Simons takes something to be 'ontologically dependent' on something else when the first cannot exist unless the second exist.

We have a primary modal characterization however, one that is far weaker that the modal operator for necessity, $'\Box'$. A characterization of existential dependence such as this would face a great deal of counterexamples in any worlds where it is possible to affirm the consequent without the antecedent, for *x* to exist without *y.* The counterfactual allows that there may be strange worlds where objects exist without their parts and consequently will not depend on them. There are often cases where it is true that things could have turned out differently to the counterfactual claim even though there will not be a case of dependence. To avoid overgeneration of cases of existential dependence that result from a counterfactual definition, we need a modal account that captures objects not merely as they typically are but how they are related at all possible worlds. If *x* depends on *y,* then *x* should require the existence of *y* in all worlds, even those that are nothing like the actual world. A stronger modal formulation has traditionally been reflected in a somewhat intuitive notion that has been described by E. J. Lowe as a rather simple and obvious proposal of existential dependence:

x depends for its existence on *y* $=_{df}$ Necessarily, *x* exists only if *y* exists. [34]

Lowe points out that the *definiens* here is equivalent to 'Necessarily, if *x* exists, then *y* exists', such that the existential dependency of *x* upon *y* amounts to the strict implication of «*y*'s existence» by «*x*'s existence».

We can represent 'depends on' here as $\propto$ and express Lowe's definition using the modal operator for necessity and the conditional operator for material implication:

(ED$_M$) $x \propto y \stackrel{def}{=} \Box(\exists z\, z = x \rightarrow \exists z'\, z' = y).$

The definiens here is equivalent to what is known as 'modal necessitation':

[34] Lowe, "Ontological Dependency." 31.

x modally necessitates *y* iff it is metaphysically impossible that *x* exists, and *y* does not.[35]

Given the conceptual necessity of this definition that for «$x's\ existence$» to obtain, then «$y's\ existence$» must also obtain, modal-existential dependence is logically equivalent to modal necessitation:

$\Box(p \rightarrow q)$ is logically equivalent to $\neg \diamond (p \wedge \neg q)$.

This analysis of existential dependence was once a dominant approach and can be termed the *modal-existential theory* of dependence.

The modal-existential account tells us that an object with a complex description, necessarily exists when another does; however, the modal operator does not do the work of ensuring that when an object necessarily exists, it is also restricted to being the kind of thing that it is expressed by its complex description. If an object is free to be the bearer of any qualitative properties, then it may be possible that there is some state of affairs in which it does not depend on what we typically think it does. Under the modal conception, parts and their complex descriptions may necessarily exist when wholes that depend on them do, but it does not entail on the basis on modal logical alone, any further commitment to what kinds of things individuals can possibly be. As opposed to treating objects as bare particulars in which they lack a modal profile such that for every individual and every property, there are possible worlds in which individuals have the property and possible worlds where they individual does not, we may say there are properties that are *essential* to them.[36] For instance, any individual human could not fail to be the kind 'human' so the property of being human would count has an essential property of each human.

One way to interpret this notion of essence is in terms of modality where we interpret 'could not fail' as meaning that it is *necessary* that a human have the property of being human, then we have a *modal characterization of essential properties*. On this view, the

[35] Correia, *Existential Dependence and Cognate Notions*. 46.
[36] Robert Stalnaker, "Anti-Essentialism," *Midwest Studies In Philosophy* 4, no. 1 (1979), https://doi.org/10.1111/j.1475-4975.1979.tb00385.x. 344.

essential properties of an object are those properties it *must* have. Consider a few examples. An individual apple may depend on its water and carbohydrate molecules such that *being made of water and carbohydrates* may plausibly be an essential property of it. The property of *being red* however is not essential as an apple's colour can change without changing what kind of thing the individual is. If *being made of water and carbohydrates* were not an essential property of the apple, then perhaps it could have the property of *being made of wood* or *being a benchtop,* which would mean that it did not depend on water and carbohydrates and the apple tree that it was produced by. Where a person exists, and so too does the temporally extended event that is her life, we may say that *x's* life exists only if *x* exists. The property of *being the life of Mary* is an essential property of Mary's life. If this is so, then Mary's life could not fail to have this property and could not depend on anything other than Mary. But we do not mean that her life could not be qualitatively different in many ways in order for her life to depend on her. Rather, she could not have had a numerically different life to the one that is essential to her. In fact, even if she could, for argument's sake, have a life that is 'other' than hers, no one other than Mary could have had it. Other possible worlds may contain lives that do not exist in the actual world to the extent that they contain people who do not exist in the actual world, but we have no reason to suppose that they contain other lives as alternative, numerically distinct lives of the people they depend on.[37] Alternatively, there have been far richer conceptions of essence employed in the distinction between essential and accidental properties. An essence might be characterized in terms of what an object is like rather than what properties or features it has, necessarily. For instance, a definitional characterization of essential properties treats essential properties as those that are part of the object's 'definition'. Of course, this involves the challenge of developing a clear notion of an object's definition. Presently, I shall not take a stance on what the right conception of an essential properties is here. In what follows, we shall see what conception of essence is used by the modalist and why problems cases for this account have led others to make use of these richer notions of essence which will in turn be discussed further.

[37] Lowe, "Ontological Dependency." 36-37.

1.3.1 Rigid modal-existential dependence

Lowe's initial definition of existential dependence seems to capture a single intuitive notion that is one direction of the relation. If *y,* the dependee does not exist, then the dependent object *x* does not exist. This definition is characterized by rigid existential necessitation and should be analyzed on this account as *rigid existential dependence:*

x rigidly depends for its existence upon *y* $=_{df}$ Necessarily, *x* exists only if *y* exists.[38]

In other words, the rigid dependence of *x* upon *y* results in the strict implication of a specific *y's* existence by a specific *x's* existence, not something very similar to *y* or something that shares in a category with *y.* It must be that *exact y.* A set rigidly depends on its members because necessarily, when the set exists, the members exist too. It cannot be that some other objects that are not essential to what the set is, are the members of the set. A particular event such as my birth rigidly depends on me since my birth could not have existed without me. The birth of another person could have existed at the very same time and place as mine but for my specific birth to exist, I must also exist. Rigid existential necessitation can be expressed using the modal operator '□' to mean metaphysical necessity, where '*E'* is the existence predicate indicating '*x* exists' and where '→' is the the two-place sentential operator indicating material implication:

(EDRM) $\quad x \propto \mathrm{y} \stackrel{\text{def}}{=} \Box(Ex \rightarrow Ey)$.[39]

The left to right direction of the relation binds the existence of *x* and its essential properties to the existence of *y* and the properties *y* has in all possible worlds such that in all possible worlds where *x* exists, *y* must also exist. However, this formulation of existential dependence is not fit for all cases where we think objects require another for their existence. For instance,

[38] Lowe, "Ontological Dependency." 31-32.

[39] This somewhat controversially, implies that everything depends for its existence upon *itself*. It would, of course, be easy enough to modify the definition to read "*y* is not identical with *x* and, necessarily, *x* exists only if *y* exists", but that would have the disadvantage of *precluding* anything from depending for its existence upon itself. Lowe formulates the relation of identity dependence to prevent everything from depending on itself however, does not want to preclude *some* things from depending on themselves, hence he offers the definition: ***x*** depends for its existence upon y iif necessarily the identity of *x* depends on the identity of y.

as I mentioned in the previous section, composite objects depend for their existence upon their proper parts, but it is often not any specific parts or individuals that are needed for the existence of the composite object. While objects must have parts, which specific objects those parts are is not essential to the object so it will not depend on those parts in the way described by rigid dependence. It is not the case that *x* will only exist if *y* exists, and that the relation holds only in this direction. Instead, it is true to say that composite objects *generically* depend on their parts.

1.3.2 Generic modal-existential dependence

We commonly make general statements of dependence and here I will introduce generic dependence for the modal-existentialist in two forms. We claim that, in general, sets depend for their existence on their members. Claims such as this may be explained in terms of their particular claims of dependence such that for each set *x* and member *y, x* depends upon y.[40] The generic claim that a set depends on its members is simply less particular about what is needed for existence. In cases such as this we can say that where there is generic dependence there is an object *y* such that (i) *x* rigidly depends on *y,* and (ii) necessarily, if *y* exists, then *y* is of the sort *F*. This would apply to a trope which is the particular whiteness of a certain enamel surface. The trope rigidly depends on the surface, and the surface is *essentially* an enamel surface, such that it cannot exist without being enamel. Then, the trope generically depends on enamel surfaces.[41] Similarly, consider the claim that electricity generically depends on electrons. Electrons are an atom of a certain kind, but any instance of electricity will necessitate the existence of some electrons that are necessarily indistinguishable from all electrons. Again, in a case such as this we might say that *x* generically depends on some *F*s iff:

Any instance of *x* rigidly depends on some *z*, and necessarily any *z* on which it depends are *F*s. Note that the electricity in question necessitates the existence of some electrons but they will be of a general kind of thing i.e. atoms that are electrons. Every instance of electricity will depend on some electrons as all electrons are the same kind of

[40] Fine, "Ontological Dependence." 287.
[41] Correia, "Ontological Dependence." 1016.

thing, but the existence of some certain electrons is necessitated by a certain instance of electricity.

There are other cases of generic dependence whereby we cannot say that the existence of the object necessitates any individual, even a specific individual of a certain sort. We cannot simply generalize the kinds of objects necessitated by objects that depend on them because no one object's existence is rigidly necessitated by the existence of another. We could define this 'generic' notion of existential dependence as follows:

x generically depends for its existence upon objects of the kind *K* $=_{df}$ Necessarily, *x* exists only if something *y* exists such that *y* is of the kind *K*.[42]

Composite objects are existentially dependent in this sense when they require the existence of proper parts where *K* is set as 'proper part of *x*'. While a composite object must have some proper parts that are not any specific parts, they must be things that are specified as proper parts of *x.* Aristotelian universals too, depend on the existence of particular exemplars making *K* 'particular exemplar of *x'*. Fine explains this notion of generic dependence in terms of a type that is understood by reference to a token of its type. A type depends on a token of that type such that each type will depend on one of its tokens. The claim is also universal since the type depends on any one of its tokens. A type *t* may depend upon one of its tokens, *F*, where *F* is the predicate 'is a token of *t*', even though it does not depend upon one of the tokens Y_1, Y_2, … of the type. That is, it does not depend upon a *G*, where *G* is the predicate 'is one of Y_1, Y_2, …', since the existence of the type does not require the existence of those particular tokens and does not rigidly necessitate the existence of any particular one of them.[43] If an object *x* depends on an *F* where *F* is the same predicate 'is a token of type *t*', *x* depends on *F* is true, since *x* and its complex description cannot exist without an *F*.

For this version of generic dependence, which I shall refer to as *generic-kind dependence*, each class of things depends on an individual of that kind such that a certain class of things depends on (any) one of its individuals. And each class can have its qualitative

[42] Lowe, "Ontological Dependency." 35.
[43] Fine, "Ontological Dependence." 289.

character specified by any one of its individuals. On this version of generic dependence, we have an indefinite reading since the class depends upon one of its individuals, but not upon any particular one. It is essential to the class that it not exist without one of its individuals such that *x* will depend upon an *F* if, in virtue of *x's* qualitative character that cannot be specified without an *F*, *x* cannot exist without an *F*. The nature of an object can only require the existence of a certain kind of object if something of that kind is required for the object's qualitative character to be specified.

Generic-kind dependence can be expressed with the addition of '∃' as the existential quantifier and '*F*' as a restricted predicated 'is of the kind or class of *x'*:

(ED$_{GM}$) $x \propto y \stackrel{def}{=} \Box(Ex \rightarrow \exists y(Fy))$

This formulation says that there only need be some *y* that exists that is F, but no individual is rigidly necessitated by *x's* existence. If we make a generic dependence claim about the kind of things that certain objects rigidly necessitate then *F* may be the predicate 'is among the things identical to *y'*. This could apply to our example of electricity that depends on electrons where when an instance of electricity exists there will be some electrons that are identical to those things that are rigidly necessitated by the existence of electricity.

Finally, consider a dragonfly that is a living organism that depends on some cells. The dragonfly must be essentially a living organism for there to be some cells that accompany it in all possible worlds when it exists. Otherwise, there may be some possible world where the dragonfly exists without cells and is accompanied by snowflakes - which we would not think it depends on since there is no living dragonfly made of snowflakes. Even though the dragonfly depends on its cells, those cells can change which cells they are and yet the dragonfly persists, undisrupted. Consequently, no individual cells will be rigidly necessitated by the dragonfly's existence despite the fact that it cannot exist without them, nor can any other objects be necessitated by its existence in all possible worlds where it exists.

Now, let us say that *x's* being a persisting *F*, where *F* is the predicate 'is a living organism' generically depends on the *Gs*, where *G* is the predicate 'is some cells' iff:

(i) always, *x* is an *F*; and (ii) necessarily, *x* is an *F* only if a *G* exists.

The dragonfly's essentially being a living organism depends generically on some cells existing just in case, always, the insect is a living organism and necessarily the insect is a living organism only if the cells exist. Here we have a case were, necessarily an object that undergoes change must have specifiable qualitative character and depend on other objects of a certain kind, yet no individual cells A_1, $A_{2...}$ must be rigidly necessitated by the persisting dependent object.

These various 'modalist' analyses compose a family of existential dependence relations. Two famous objections have been raised to this existential formulation of ontological which will now be presented in what follows.

1.4 Objection to modal-existential account 1: Necessary existents

It is an open question as to whether there are necessary beings, however many philosophers think there are such things – that numbers, or pure sets, or propositions necessarily exist. Following from the modal definition of existential dependence, as a matter of conceptual necessity, everything modally necessitates any necessary existent. The worry then is that something that exists necessarily is a universal dependee meaning everything will depend on it directly, regardless of whether the supposed dependee is a fundamental object. Consider the claim that the empty set must exist. Then:

Everything depends on the empty set

Everything will depend on the empty set given that it meets modal necessitation: it is metaphysically impossible that anything exists when the empty set does not. Then by conceptual necessity this is a case of existential dependence. In the view of many if not most philosophers, this claim is false as we are not inclined to think that the existence of everything

depends on the existence of the empty set. Most do not deem anything about the empty set to be universally relevant to the existence of all other objects.[44] The set that contains the empty set as its sole member is the obvious exception here. To exemplify the issue with a peculiar philosophical position, consider that anyone who thinks that everything exists necessarily will be committed to an extreme form of holism where everything depends on everything for existence. At the heart of this objection is the problem that if our ontology accepts the necessary existence of anything, then we are forced to accept that everything whatsoever, depends on it.

In the first instance, we should not exclude necessary existents from being dependees altogether. This might have been a tempting resolve and with an additional clause, such that, '*x* depends on *y* iff *x* modally necessitates *y*' and '*y* is not a necessary existent' all necessary existents would be prevented from being depended upon. Yet some philosophers might want to say that some things depend on some other things and that the latter exists necessarily – for example, God exists necessarily, and all living beings depend on her. If this is a false claim of existential dependence, then it is false because all living things depend on something else, not because of God's necessary existence. Even if the empty set ∅ is a necessary existent, the singleton of the empty set {∅} still depends on it in the same way all sets depend on their members.

1.5 Objection to modal-existential account 2: Necessary co-existents

The second familiar problem is for wholly distinct objects that share a necessary connection or whose existences necessarily coincides. The most familiar example is supplied by Kit Fine where for there to be a set with a sole member {Socrates}, there necessarily must be a real man that exists as a member of the set. And, whenever the man Socrates does exist there will necessarily be the singleton set of which he is the sole member.[45] The mutual modal

[44] With the exception of those who are persuaded by Hud Hudson's *Confining Composition* (2006) who argues precisely that the distinctive feature of the null individual (an analogue of the empty set) is that it is part of everything given that it overlaps or has a guaranteed intersection with everything. Perhaps in this way, one could argue that if the empty set did not exist then nothing would exist so the existence of the empty set is needed to secure that anything can exist, so any existing thing does depend in at least this way on the necessary.
[45] Fine, "Ontological Dependence." 271. Fine also gives the example of the existence of Socrates as a state of affairs that necessarily exists just in case Socrates does – again, we do not want to say that what Socrates is depends on the state of his existence.

necessitation of the set and its sole member then appears to entail two claims of existential dependence:

(a) *{Socrates} depends on Socrates*
(b) *Socrates depends on {Socrates}*

We are inclined to think that (b) is false and that Socrates and what Socrates is cannot depend on what the set is. It is a plausible truth of modal set theory that in every possible world when some given object x exists, the corresponding singleton $\{x\}$ exists also, so then everything modally necessitates its own singleton set. This result is due to the obvious fact that a set exists in a world iff all its members do.[46] The logical equivalence of existential dependence and modal necessitation means that while the existence of Socrates the man modally necessitates the singleton set, we are not able to deny that this entails a claim of existential dependence. However, relations of existential dependence are almost always thought to be structurally asymmetric.[47] This structural feature aids in ensuring our dependence relations capture what really is 'relevant' to an object's existence. We find cases of symmetric dependence counterintuitive and incompatible with the normative structural constraints of good explanations. These issues faced by the modalist suggest this account is too course-grained to supply asymmetric dependence relations when we need them.

The modal-existential account favors the modal characterization of essence which says that *P is an essential property of o, just in case it is necessary that o has P or just in case o has P in all possible worlds*.[48] For some object, there may be a possible world in which it does not exist and since it does not exist there, it will not have any of its essential properties such as *being human* or *being made of wood*. This will mean that such properties are treated as mere accidental properties in the worlds where it does exist, since it does not have those properties at *all* possible worlds. To avoid this problem, the modalist must add the stipulation

[46] Kit Fine, "First-Order Modal Theories 1 - Sets," *Noûs* 15, no. 2 (1981), https://doi.org/10.2307/2215323. 180.
[47] For a view that challenges this orthodoxy see, Elizabeth Barnes, "Symmetric Dependence," in *Reality and its Structure: Essays in Fundamentality*, ed. Ricki Bliss and Graham Priest (Oxford UK: Oxford University Press, 2018).
[48] Stalnaker, "Anti-Essentialism." 343.

that for a property to be had essentially, the object must have the property and it is necessary that the object has the property if it exists.[49] In both rigid and generic variations, there is a commitment to what is possible for individuals met by the modal characterization of essential properties just now discussed, which can be expressed:

F is essential to a iff $\neg\Diamond(\exists x\ x = a \wedge \neg Fa)$.

The challenges raised to the modal conception of existential dependence arise from this modal notion of essence where necessity plays the central role in generating false cases of existential dependence. These cases should give us reason to distrust the modal notion of essence, even if we want a primarily modal characterization of existential dependence. To resolve these problem cases, we need a definition of existential dependence that will not allow the arbitrary substitution of objects into constructions like '*The existence of* ____ *depends on the existence of* ____*'* like in the way the modal-existential account allows the substitution of necessarily co-existing objects like Socrates and {Socrates}. The traditional modal account that makes use of a modal characterisation of essence cannot meet this task. Pursuing a different approach to characterising existential dependence will also require an alternative conception of an essential property if these problems are to be avoided. This is what I shall turn to now.

1.6 Hyperintensional accounts of existential dependence

In response to objections raised to the account given by the 'modalist', many contemporary metaphysicians have preferred *hyperintensional* accounts of existential dependence. It is generally the mark of hyperintensional concepts that they do not allow for the substitution of *intensionally equivalent* terms without changing the truth value of statements in which the expression occurs.[50] If two sentences share in their intension, they

[49] A minor concern is that this additional qualification treats existence as an essential property of every object since no object could lack existence and yet exist. So, we should declare here that the claim that an object has existence as an essential property will not mean it has the property of *being existent if existent.* Anything that exists at all possible worlds can be said to have existence as a *necessary* property, instead.

[50] Michael Duncan, Kristie Miller, and James Norton, "Is grounding a hyperintensional phenomenon," *Analytic Philosophy* 58, no. 4 (2017). 300.

are *true* in all the same worlds; they are necessarily equivalent. Nolan has recently described a hyperintensional position (in a sentence) as one that is both non-intensional and non-extensional.[51] Nolan describes the extension of a name or description as the *object designated*; the extension of a predicate is the set of actual objects to which the predicate applies; the extension of an entire sentence is its truth-value. A position in a sentence is extensional if other expressions that have the same extension can be substituted into that position without changing the truth-value of the sentence.[52] Then, a position in a sentence is intensional if expressions that are intensionally equivalent are freely substitutable in that position without change in truth value.

Here, we are especially interested in hyperintensional *constructions* and forbidding arbitrary substitution of intensionally equivalent expressions of any category so that we may say that, for example, 'Socrates exists' and '{Socrates} exists' come apart in their intension and extension when we make true dependence claims about them. The most relevant are cases where the expressions are sentences/propositions. If the construction is expressed by a binary operator H, then $H(x, y)$ is hyperintensional iff $\neg(H(a, b) \leftrightarrow H(c, d))$ even when a is intensionally equivalent with c, and b is necessarily coextensive with d. Then, let a, b, etc. be propositions about existence, so that a is the proposition '$\emptyset$ exists', and b is the proposition '$\{\emptyset\}$ exists' then we can have $\neg a \propto b$ and $b \propto a$ even though the propositions a and b are intensionally equivalent. Importantly, the notion of an extension here applies to things other than terms: all semantic categories (names, predicates, sentences) can have extensions. This will then apply to a sentence 'x depends on y' not just the names Socrates and {Socrates}. Going forward, I will adopt the widespread and plausible view that sentences that make existential dependence claims are hyperintensional.

1.7 Fine's existential essential dependence

On this note, many readers will have in mind Kit Fine's notable attempt at deploying hyperintensional distinctions in the service of theorizing about the non-representational world and in the case of existential dependence. Fine insists that investigations into

[51] Daniel Nolan, "Hyperintensional metaphysics," *Philosophical Studies* 171, no. 1 (2014), https://doi.org/10.1007/sl. 151.
[52] Nolan, "Hyperintensional metaphysics." 151.

the *essences* of things must play a central role in metaphysics and that expressions and concepts that involve essences must be hyperintensional. The idea is that if we have the constructions '*x* is essentially *F'* then we cannot guarantee truth preservation by substituting intensionally equivalent predicates on either side of '…is essentially…'. In his theory of essence, Fine famously argued that the singleton *essentially* contains the man, yet it is not plausible to suppose that the man is contained essentially in the singleton.[53] Fine considers essential properties to be those that an object has in virtue of its identity and refers to the nature of an object as the source of its essential properties.[54] Any real definition of Socrates will involve that he is essentially human but not that he is essentially human and a member of a set, even though *necessarily* any human is human just in case they are also a member of a set.

In *Ontological dependence,* Fine wants to substitute the notion of essence for that of necessity so that the appropriate connection between the existence of *x* and the existence of *y* is not that it be necessary that *x* exists only if *y* exists but that it is an essential property of *x* that it exists only if *y* does. The proper expression of the claim that *x* essentially Θ's would not be that it is necessary that *x* Θ's if it exists, for some vague notion of necessity, but that it is true in virtue of the identity of *x* that it Θ's, or that *x* Θ's if *x* exists.[55] If we can be sure that essence will discriminate between necessary existents and necessary co-existents, then this hyperintensional formulation of existential dependence should rid us of the difficulties that beset the modal-existential account. Modality does not do the work to establish dependence but instead facts about *x* guarantee the dependence relation. The necessity of the conditional 'x exists only if *y* does' should be relevantly tied to the nature of the dependent entity *x.* Essential existential dependence can be defined as:

x depends for its existence upon *y* $=_{df}$ It is part of the essence of *x* that *x* exists only if *y* exists.[56]

[53] Kit Fine, "The Logic of Essence," *Journal of Philosophical Logic*, no. 24 (1995).
[54] Alexander Bird, "Essences and natural kinds," in *The Routledge Companion to Metaphysics*, ed. Robin Le Poidevin (London, United Kingdom: Routledge, 2009).
[55] Fine, "Ontological Dependence." 273
[56] Fine, "Ontological Dependence." 273.

We may also reinstate a rigid and generic version of essential dependence here too in much the same way as rigid and generic modal existential dependence. To formalise essential existential dependence, we can follow Fine, using the sentential operator $\Box_x$ to mean 'is essential to *x'* and *e* is the 'existence predicate' so that when *x* rigidly essentially depends on *y*:

(ED$_{RE}$) $x \propto y \stackrel{def}{=} \Box_x(Ex \rightarrow Ey)$.

And when *x's* existence essentially depends on *y's* existence for being a generic kind:

(ED$_{GE}$) $x \propto y \stackrel{def}{=} \Box_x(Ex \rightarrow \exists y(Fy))$.[57]

Fine argues that we ought to accept *x* to depends on *y* iff *y* is a *constituent* of a proposition that is true in virtue of the identity of *x* or, if *y* is a constituent of an essential property of *x*. Constitutive essences are those had in virtue of not being a logical consequence. Constitutive essences can be contrasted with *consequential* essential properties which are those that can be *generalised* out of a collection of propositions that belongs to the essence and whose generalisation does not belong to the essence. Objects that are dependees cannot be generalised out of the consequential essence of the dependent object.[58] This is because only the (constitutive) being or essence of *x* can be identified with a collection of propositions that are true in virtue of an object's identity. The claim that the constituents of an essence are propositions that are 'true in virtue of the identity of x' may appear to suggest an analysis of the operator into the notions of the identity of an object and of a proposition being true in virtue of the identity of an object, Fine does not wish to suggest such an analysis. Instead, identity is an unanalyzed relation between an object and a proposition. According to Fine, we should understand the identity or being of the object in terms of the propositions rendered true by its identity rather than the other way round.[59] The proposition '$a = a$' is true in virtue of the identity of a, however will not be subject to a further analysis that might suggest it has

[57] Fine, "Ontological Dependence."288.
[58] The property of containing Socrates as a member will be part of the constitutive essence of singleton Socrates whereas the property of containing some member or another will be part of its consequential essence.
[59] Fine, "Ontological Dependence." 273.

its identity as a constituent and yields the claim that 'a depends on the identity of a'. A collection of propositions provides a real definition of an object in terms of what is essential to it. Fine thinks this definition lends itself to a natural way to talk of understanding what a thing is in connection with dependence. We understand a defined object though the object upon which it depends - we know one thing or conceive of it through another.[60]

But why the invocation of propositional constituents? Fine asks us to accept that propositions and properties may be said to contain objects as constituents, but what kind of ontological commitment must we make to propositions to have this proposal of essential dependence? Are the constituents of propositions the properties a thing *y* must have to be a possibility for *x,* such that all possibilities for me are ones where I am human person which is true in virtue of my identity? Perhaps this means that in a qualitatively described possible world, such propositions that are true in virtue of the identity of an object are those that identify an object with something in the possible world for that object. However, how can we know what conditions need to be met for a qualitatively described possibility to be the object? This unanalyzable notion of identity will not be helpful.

Fine's sophisticated take on dependence relations considers the substantive features of an object that it depends on another for and has the potential to avoid problems that typically beset any existential account of dependence. The cost however as I see it, is a rather heavyweight ontological commitment to essences. This cost would be minimised if we could have a clearer understanding of what essences are or what they involve. But in contrast to a modal characterisation of essence, are we confident enough in our understanding of the primitive notion of essence that we're sure nothing can *essentially* be a member of a set? It is part of my essence that I am human; why aren't I essentially a member of the set of humans? Many theorists may find this notion of essence controversial so it would seem theoretically virtuous to accept a more ontologically parsimonious framework. If we can explain much the same phenomena as Fine's account can in answering for our intuitions about impermissible dependence relations without such demanding requirements, then we should favour a more parsimonious framework that can get by, through employing existing metaphysical resources.

[60] Fine, "Ontological Dependence." 275-276.

1.8 Concluding remarks

Here I have presented some traditional approaches to characterizing existential formulations of ontological dependence in terms of the modal-existential and essentialist accounts. Firstly, modal-existential accounts tend to say that one entity cannot exist without the entity it depends on such that the existence of a dependent object requires that a condition of a certain sort be met. Many are familiar with the problems associated with the modal-existential account. That is, it allows there to be dependence relations in places where they should not be – specifically this is an issue for metaphysical theories that posit necessary entities or necessary connections between wholly distinct entities. We could avoid some of the challenges raised for the modal-existential account with some qualifications, like allowing dependence to hold only between contingent objects. However, the challenges raised do nevertheless call for an alternative, more fine-grained account of existential dependence that could also be applied in such cases. In contrast, essential dependence involves requirements for an unanalyzable notion of identity or essence. Where it is part of the essence of an object that it depends on another for its existence, the dependent object would not be the object that it is had a condition of a certain sort not been met.[61] Fine's account not only requires some suspicious additions to our ontology in order to gain an appropriate account of a basic notion of dependence, but also raises some of its own internal complications to do with capturing dependence in terms of propositions that are true in virtue of the object's identity. Thus, neither account of existential dependence as they stand are ideal. Going forward, I propose that we should not abandon our existential formulation but rather, seek to develop a framework that can handle the problem cases of the modal-existential account while keeping the ontological commitments required to do so to a minimum. It is my view that we can remedy these issues with a modified modal definition of existential dependence without needing to pay the ontological price that comes with a commitment to ideological primitives. Proposing this new principle of existential dependence will take some work however, to achieve our aim we can easily utilise some existing metaphysical resources and draw on an analogy with causation to set the stage for a novel approach to analysing existential dependence. The task of drawing an analogy between

[61] Correia, "Ontological Dependence." 1014.

existential dependence and causation so that we can find the right causal framework for our needs, is what I shall turn to next.

2. Understanding Existential Dependence: An Analogy with Causation

"By 'illumination by analogy', I simply refer to the general fact that it is sometimes fruitful to think about one philosophical arena in terms of another… one domain is illuminated by thinking through the lens of – by analogy with– the other… Thinking about one will shed light on the other if and only if there are deep structural parallels between them."

Bennett (2017) p. 71-72

"…nothing happens without a cause… nothing exists without underpinning – everything is built."

Bennett (2017) p. 73

2.1 Introduction

In recent times, philosophers such as Jonathan Schaffer and Alastair Wilson have taken seriously the analogy between grounding and causation – treating grounding with the structural equation models for causation which they think has the added benefit of yielding a unified theory of explanation. Where Wilson claims 'there is a systematic and suggestive analogy between grounding and causation',[62] Schaffer takes grounding and causation to be species of the same genus of *directed determination relations,*[63] and Karen Bennett argues they are members of a family of *building relations.*[64] This literature suggests that there is some useful analogy to be drawn between the notions of causation and relations like existential dependence, that would appear relevant to how we approach their formal treatment. There are points of dissimilarity such as for instance that existential dependence relations are typically synchronic, whereas causal relations are diachronic. Moreover, we

[62] Alastair Wilson, "Metaphysical Causation," *Noûs* 52, no. 4 (2018), https://doi.org/10.1111/nous.12190. 723.
[63] Schaffer, "Grounding in the image of causation." 96.
[64] Bennett, *Making Things Up*. 71.

tend to think that there is such thing as 'causation by omission' where it is the case that something does not occur and that is the cause of some other event. Effects can be omissions too when the cause prevents something from occurring.[65] There is no analogous 'omissions' for existential dependence, since non-existent entities cannot be required for the existence of exiting objects and no non-existing thing depends on something which exists. However, the fact that there are some disanalogies should not stand in the way of making a suggestive analogy that a theory of causation may be a good place to look for inspiration for a new theory of existential dependence.

In this chapter, I explore the analogy between causation and existential dependence, and suggest that there are sufficient similarities to think that accounts of causation could inspire the framework for an account of existential dependence. I propose that the analogy reveals that causation and dependence relations are alike in their internal structure (2.2) and connection to objective explanation (2.3). In terms of internal structure, both relations are usually treated as a strict partial order in that they are irreflexive, asymmetric and transitive, and their having these logical features has been challenged in similar ways (2.2.1). We can also draw a distinction between sufficient and contributory causes in the same way in which we can draw a distinction between full and partial dependence (2.2.2). In terms of the relation to objective explanation both dependence and causal relations play an important role in a widely accepted backing theory of explanation. Here we also touch on counterfactual accounts and why they, like many accounts of causation are too weak to capture the tie between the relata in existential dependence relations (2.4). Perhaps then, an account of causes that makes use of parts of sufficient condition for effects might be better suited for our task (2.5). With this in mind, I draw on a neglected contender for theories of causation – J. L. Mackie's regularity theory of causation (2.5.1). Mackie's theory and use of the INUS condition has been long dismissed as a theory of causation as it makes use of both background conditions and causes that cannot be distinguished from one another (2.5.2). As a theory of existential dependence however, an INUS inspired approach raises some hope for successfully capturing the relation of interest. Presenting this framework for existential dependence will be my aim for chapter 3. To be clear, I will not be advocating for Mackie's

[65] Sara Bernstein, "Grounding is not Causation," *Philosophical Perspectives* 30 (2016). 26-27.

theory as the right approach to causation. It is ill suited for that task. I will argue however that what Mackie's theory is arguably more suited for, is an account of dependence relations that require a stronger connection between the relata that guarantees the obtaining of two states of affairs when one object requires the existence of another.

2.2 The analogy with causation: Internal structure

We may say that the causal order or causal structure of individuals is formed by causal relations and the dependence order or structure of individuals is formed by existential dependence relations. Perhaps then, we can note some similarities in the logical properties of causation and dependence. Below we shall look at how both causal and existential dependence relations are often treated as strict partial orders, and how each can be subdivided into notions of partial dependence/causal relevance and full dependence/causal sufficiency.

2.2.1 Partial ordering

Binary relations are pervasive and since they are so widespread, it is not hard to identify some common logical features that many of them share. Consider Jean who prefers oranges to apples and prefers apples to avocadoes. In a fruit bowl with only oranges and avocadoes, she prefers oranges, skipping over apples altogether. Unless she changes her preferences, we would not expect her to prefer avocadoes to oranges. In the same light, three brothers Jack, John and Mike can be ordered in terms of their height; Jack is taller than John who is taller than Mike. There is no question as to who is taller when it comes to Jack and Mike. Binary relations like 'prefers', 'is taller than' or 'is faster than' that hold between two relata like fruit or brothers often display this feature of *transitivity*. Another feature of binary relations can be exemplified by the notion of parthood where, for example, my arm is a proper part of me, but I am not a proper part of my arm. Binary relations like this conform to *asymmetry*. If the constitution of an object is counted as a proper part of the object it constitutes then a statue that is made of clay has the clay as a part of it while the statue is not part of the clay. Jean cannot prefer oranges to apples and prefer apples to oranges. Lastly, we also accept that my arm is not a proper part of my arm nor does Jack, who is tallest of his siblings, stand in the relation of 'being taller than', with himself. In these last two cases, we can describe this logical feature as *irreflexivity*.

With these examples in mind, our intuitions about the logical properties of causation and existential dependence tend to follow suit such that the orthodox conception of these relations imposes a s*trict partial ordering* on the entities in their domain. That is, causation and dependence are irreflexive, asymmetric and transitive binary relations.[66] These are expressed below where 'R' denotes a binary relation:

(IR) Irreflexivity: $\forall x \neg Rxx$

(AS) Asymmetry: $\forall x \forall y [Rxy \rightarrow \neg Ryx]$

(TS) Transitivity: $\forall x \forall y \forall z [(Rxy \wedge Ryz) \rightarrow Rxz]$

It is common to assume that objects do not depend on themselves for their existence; that two objects do not mutually depend on one another; and that an object *A* that depends on *B* may also depends on parts of *B*, *C*. Existential dependence may have a close affiliation with the relation of proper parthood which is quite plausibly a strict partial order. We are often inclined to think that objects depend for their existence on their proper parts generically in that an object *x* exists just in case some parts of the kind 'parts of *x'* exist. In terms of causation, a strict partial order applies when events do not cause themselves and two events cannot mutually cause each other nor can causation 'back-track' in the temporal order of events. Typically, where the striking of a match caused a flame to appear which in turn caused a fire, we may say that the striking of the match was the cause of the fire.

These structural features shared by causation and existential dependence are not merely what backs the structure of our explanations, but they tell us something about the order of things in the world. Existential dependence relations closely resemble ontological priority in that objects and their constituents are ordered in terms of what is more or less fundamental. For a composite object to depend on its mereological atoms, we need some view about the world that says parts are more fundamental than their wholes. In the same way, we think the logical properties of causal relations tell us something about the causal structure of the world which is closely tied to the temporal ordering of events. But these

[66] Schaffer, "Grounding in the image of causation." 55.

logical properties of the relations of causation and existential dependence have not gone unchallenged, and they have been challenged in similar ways –further supporting the analogy.

The self-causing time traveler is the prime candidate for defying irreflexivity. It seems metaphysically possible that a time traveler enters a time machine at time t_1, thus causing her to exit at some earlier time t_0 and perhaps an even earlier time t_{-1}. It is not difficult to see how the self-causing time traveler is involved in lots of events which cause one another.[67] For time travelers who cause their own existence or self-causing deities, we need causation to be reflexive. Alternatively, if we think time travelers cannot be the cause of their own existence then maintaining irreflexivity in the case of time travelers will require giving up transitivity in general. Irreflexivity has been directly challenged by Carrie Jenkins in the case of existential dependence who has argued that a relation of dependence between physical states and mental states might obtain even in the context of a mind-brain identity theory which questions irreflexivity.[68]

David Lewis did not build the temporal asymmetry of causation directly into his 1979 analysis[69], allowing for the coherence of backwards causation in cases of consistent time travel. Consider the case of a time-traveler who travels back in time and arranges the meeting between their parents that leads to their own eventual birth. The meeting causes the time-travelling, and the time-travelling causes the meeting.[70] However many think the causal relation is asymmetric still, even if the principle that *causes must precede their effects* is abandoned. The asymmetry of existential dependence has recently been challenged in a similar manner. Elizabeth Barnes has given several candidate examples of symmetric dependence. These include cases such as where universals require the existence of their instantiations, they can be said to depend on their instances. If kinds are had essentially, then part of what it is to be a certain kind is to be a member of that kind – individuals depend on

[67] Wilson argues we have no special reason to think causation really is irreflexive. The irreflexivity of causation has itself been questioned by appeal to the possibilities of a bootstrapping time-traveler who is responsible for their own existence, of a self-causing deity, or of a self-causing concrete universe. Although these cases may present as unusual since they do not relate events.
[68] Carrie Jenkins, "Is Metaphysical Dependence Irreflexive?," *The Monist* 94, no. 2 (2011).
[69] David Lewis, "Counterfactual Dependence and Time's Arrow," *Noûs* 13, no. 4 (1979).
[70] Wilson, "Metaphysical Causation." 727.

their kinds. Combining these two doctrines yields symmetric dependence. For universals that correspond to essential properties, the universal depends on instances, and the instances depend on the universal. All things that are members of the kind *x* would not be the very things they are without the universal of being an *x*. Further, David Armstrong's states of affairs, trope bundle theories, mathematical ontology and the metaphysics of events are all cases where Barnes claims dependence can be symmetric.[71] Barnes is hesitant that this class of metaphysical theories should be ruled out by the commitment to asymmetric dependence and that rather, dependence should be neutral across various ontologies.

The most notably challenged of the logical properties of the strict partial order has been transitivity. There is a strong intuition that causation is transitive, where a case of ordinary causation is transitive if it has this structure: *e depends counterfactually upon d, which in turn depends counterfactually upon c, and e also depends counterfactually upon c*. Most cases of causation are ordinary, allowing us to explain why *c* counts as a cause of *e* just by identifying causation with counterfactual dependence. "Extraordinary" cases occur when we judge that there is causation without counterfactual dependence which is evident in the problem of pre-emption where an alternative cause pre-empts the actual cause. Consider an assassin-in-training is on his first mission. The trainee is rather skilled so if he shoots his gun, the bullet will kill the victim. The supervisor is also present in case the trainee becomes nervous and does not pull the trigger. If the trainee does not fire, the supervisor will shoot the victim herself. In fact, the trainee performs perfectly, firing the gun and killing the victim. In this case, it seems that the trainee's shot caused the death of the victim, even though the victim's death does not counterfactually depend upon the trainee's shot. By shooting at the victim, the trainee preempted a process that would itself have resulted in the victim's death. The standard solution is to invoke the transitivity of causation: the trainee's shot is a cause of the victim's death because there is a chain of counterfactual dependence running from the former to the latter. We can see why this case causes trouble for transitivity by adding in the presence of a bullet travelling from the trainee to victim and calling this event 'b'. Then we have the following counterfactuals: *Had the trainee not shot, b would not have occurred*; and *if b had not occurred, the victim would not have died*. In this case we risk incorrect results

[71] Barnes, "Symmetric Dependence." 7-9.

from backtracking in the second counterfactual: *if b had not occurred, the trainee would have shot anyway, so the supervisor would not have shot*.[72]

There are also cases that suggest causation may not be transitive in general. For example, a hiker sees a boulder rolling towards them and immediately ducks out of the way; the boulder passes harmlessly overhead, and the hiker survives. Plausibly, the falling rock caused the hiker to duck, and their ducking caused their survival, but the falling rock did not cause their survival.[73] Hitchcock has, having made use of structural equation models, argued that there is no 'active route' that can be drawn by counterfactual dependence from the event of the boulder falling to the event of the hiker surviving. The hiker's survival is caused either by the boulder not falling at all or by the hiker's ducking and moving out of the way.[74]

Can we adapt these cases for existential dependence to be sure they do not rely on features that are specific to cases of causation? Often in cases of causation that look like they may violate transitivity, we are faced with competing events. Some which appear to promote the effect like the hiker's ducking promoting her survival. Others would, all things being equal, work against the effect such as the falling of the boulder that doesn't directly contribute to the possible outcome that the hiker may survive. In cases of causation there is a lack of guaranteed connections such that effects do not always follow their causes and when there are competing causes that have different outcomes like the boulder falling and the hiker's ducking, they fail to sum together and hence produce the failure of transitivity. Existential dependence may not mirror causation in this way. The existence of objects and those they depend on is a far more reliable relationship. In cases of existential dependence, there are not often competing layers of contributors that may or may not promote the existence of an object. The candidate for a dependee will not be one that may happen to lead to the existence of an object or perhaps prevent it. If these relations differ in this way, then the objection cases for transitivity could turn on features specific to causation. However, we may be able to distinguish between cases of transitivity and intransitivity for both relations by looking to the type/token distinction for causation and the distinction between rigid and

[72] Christopher Hitchcock, "The Intransitivity of Causation Revealed in Equations and Graphs," *The Journal of Philosophy* 98, no. 6 (2001). 276

[73] Edward Hall, "Two Concepts of Causation," in *Causation and counterfactuals*, ed. John David Collins, Edward Jonathan Hall, and Laurie Ann Paul (Cambridge: MIT Press, 2004).

[74] Hitchcock, "The Intransitivity of Causation Revealed in Equations and Graphs." 276.

generic existential dependence. Perhaps at the level of rigid dependence and token causes, transitivity does hold while at the level of general/token causes and generic-kind dependence, relations do not hold tightly enough for transitivity.

Take a case of rigid dependence where I depend on my body such that my parts are rigidly necessitated by my existence. Then, certain social groups I am part of depend on me such that I am rigidly necessitated by their existence. Perhaps then the dependence relation between the social group and my body parts is transitive since they are rigidly necessitated when the certain social group exists. Typically, falling boulders do not cause hikers to survive. But a token case of causation where the falling boulder does precede the hiker jumping free of its path might in fact be the cause of her survival. Her jumping out of the way was guaranteed by the boulder plunging toward her despite the fact that she may have survived anyway if it had not fallen at all. If we frame the effect in such a way that it was guaranteed in much the same way that a dependent object exists only if the dependee does when it is rigidly necessitated then we might plausibly say there is a transitive path from the boulder to the hiker, and from a social group to my body parts. At the level of generic dependence where kinds depend on there being things of that kind and yet there are no rigidly necessitated objects that result from the dependence relation, we may not have transitivity. Social groups generically depend on their being things that are their members, not on people's body parts – especially since no body parts are necessitated by the existence of say, a chess club.

Jonathan Schaffer discusses a case of a dented sphere where the chain of existential dependence is intransitive. Shaffer claims that we can say that the shape, *S*, of object *O*, depends on the dent in *O*. *O* being near-spherical depends on *O* having *S* but *O* being near-spherical does not depend on the dent.[75] The dent detracts from rather than explains the more or less spherical shape of the object. If we treat this case as a case of generic-kind dependence where the kind or class of things that are near spherical depends on objects with the shape property of being near spherical but no individual's existence is necessitated by the dependence relation, then there being objects that are near spherical does not depend on

[75] Jonathan Schaffer, "Grounding, transitivity, and contrastivity," in *Metaphysical Grounding : Understanding the Structure of Reality*, ed. Fabrice Correia and Benjamin Schnieder (Cambridge, United Kingdom: Cambridge University Press, 2012). 126.

objects with dents. Simply, objects with dents are not tokens of the type 'being near spherical'. Similar to the competing layers of the falling boulder and the hiker's survival, dents do not promote the existence of the kind of objects that are near spherical. Again, if we are interested in claims of causation or dependence at the generic or type level then we may plausibly say that such claims are intransitive however at the rigid or token level where the event or object is guaranteed by the cause or the dependent object then such claims may satisfy transitivity. If the existence of an object with a near spherical shape does rigidly necessitate the existence of a dent, then perhaps there is transitive dependence in Schaffer's case.

If we do abandon transitivity, are we faced with violations of asymmetry? Backwards time travel would appear to allow for the possibility of causal loops, in which things come from nowhere. Loops like this are intransitive since the causal chain can pass through various events before coming back to the original one. Suppose there is a time traveler who steals a time machine from the local museum to make his time trip and then donates the time machine to the same museum at the end of the trip, in the past. In this case the machine itself is never built by anyone—it simply exists. If loops are short enough to include only two events, then it may be that we give up asymmetry also.[76] Danial Nolan has recently argued for loops of ground that give us reason to think that metaphysical dependence relations like grounding need not be transitive.[77] Nolan argues that a cosmic grounding loop is one that requires us to move 'around' the entire universe before returning to the original ground. This is analogous to a temporal loop that would require moving through every other time to end up back at the original time. Dependence loops appear when we look at (or would appear if we could look at) enormously long distances of dependence patterns. At the cosmic level, dependence does not need to be transitive. Nolan argues that dependence is locally asymmetric (also, irreflexive and transitive) when we restrict the domain of entities that it quantifies over. Whatever will be 'local' will be the right distance at which dependence relations behave asymmetrically and transitively. So on this view, we have reason to take non-symmetry

[76] Richard Hanley, "No End in Sight: Causal Loops in Philosophy, Physics and Fiction," *Synthese* 141, no. 1 (2004). 146-147.
[77] Daniel Nolan, "Cosmic Loops," in *Reality and its Structure: Essays in Fundamentality*, ed. Ricki Bliss and Graham Priest (Oxford, UK: Oxford University Press, 2018). 91.

seriously if there are cases of loops of cosmic ground that are not counter examples to transitivity.

If we take seriously these challenges to the strict partial order, causation and existential dependence may only satisfy partial orders which are assumed generally to be reflexive and antisymmetric:

(R) Reflexivity: Rxx

(ANTI-S) Antisymmetry: $[(Rxy \wedge Ryx) \rightarrow x = y]$

The most widespread responses to these challenges to the strict partial ordering of causation and dependence has been to reject all alleged cases of symmetric dependence and symmetric causation or, to endorse asymmetry for each relation only when restricted to some more specific subject-matters.

There are some partial orders that may also satisfy connectedness, in which case, they would qualify as a total ordering. Consider the claim that *water depends on H_2O*. We know water is a chemical compound and water molecules are a piece of matter that requires hydrogen and oxygen for it to exist. A total ordering of existential dependence would further entail that for two water molecules W_1 and W_2, in the chain of dependence, W_1's molecular compound of H_2O is above the specific hydrogen and oxygen of W_2 at the atomic level, when there is actually no existential dependence relation between them. Similarly, say the existence of my kitchen table depends on the existence of the atoms that compose it, and perhaps the existence of your lounge chair depends on the existence of the atoms the compose your chair. It is very unlikely however, that an existential dependence relation obtains between the atoms that compose the table and the atoms that compose the chair. Total orderings are connected, $\forall x \forall y(Rxy \vee Ryx)$, and it isn't true that any two arbitrary entities have any direction of dependence between them whatsoever.

The relationship between existential dependence and fundamentality can be clarified when we take a look at one of the problems with aligning relative fundamentality and existential dependence in terms of ordering. Not all things that are ordered by relative fundamentality (the relation of more- or less-fundamental-than) are ordered in the same way

by existential dependence. An atom that is part of the Sydney harbor bridge is more fundamental than the roof of my house without there being any dependence relation shared by the two specific entities. If the conception of hierarchically ordered layers of reality demanded a total ordering, then every pair of entities needs to be related by being above or below or on the same level. A total ordering then would not even satisfy a strict total order given that it would be reflexive and anti-symmetric: $\forall x \forall y\ ((Rxy \wedge Ryx) \rightarrow x = y)$. A randomly chosen pair of entities in not likely to be related by existential dependence so the ordering, while capturing reality's hierarchical structure, is a mere partial ordering. Again, on the standard assumption of metaphysical foundationalism, existential dependence does have a special connection to fundamentality as dependent objects are less fundamental than their dependees and those objects that do not depend on anything are supposed to be fundamental. Although, there is nothing in the axioms of partial order requires there to be any such things: some partial orders have bottom/top elements, and others don't.

Causal connections on the other hand, typically structure the world with respect to time, rather than fundamentality.[78] While causal relations have no special connection to fundamentality, they do have an analogous connection with an analogous kind of ordering. That is, a connection to temporal ordering. The same concern about total orderings applies to causal relations in terms of temporal orderings of events. So, while it is possible for some partial orders to be total, this will not be assumed here for causation or existential dependence.

2.2.2 Full dependence/causal sufficiency and partial dependence/causal relevance

There are a wide range of relations that appear to be conceptually intertwined in terms of how they are invoked in metaphysics to describe phenomena like 'building', 'making' or 'generation'. These include relations such as, for instance, composition, constitution, realization, emergence, and causal dependence.[79] Here I think we can illustrate the analogy further in that we can make some distinctions that this family of relations, inclusive of both existential dependence and causal dependence, share, such that objects or events either

[78] Wilson, "Metaphysical Causation." 731.
[79] Bennett, *Making Things Up*. 8-15.

'build' or 'make' on their own, or, they are only partial builders or makers, needing the help of something else. In some cases, two distinct objects or events may be sufficient to build or make something on their own however, both may be grouped together as participants in the total factors for the results such that they do not do the building or making on their own. For example, consider Amy and Liam who jointly row boat *A* across the finish line in a rowing race. Lisa and Judah jointly row, boat *B* across the finish line at the same time so when the tape is broken at the finish line, the breaking of the tape is overdetermined by both boat *A* and *B*. In this example, we can think of the causes of the tape breaking in three distinct ways. First, Amy's and Liam's jointly rowing boat *A* can be grouped together as a *complete* cause of the tape breaking. Secondly, Amy's solo rowing was an *incomplete* cause and finally, the total rowing's of boat *A* and *B* can be grouped together as the *total cause* or *total set of factors* that caused the breaking of the tape.[80] Two or more causes may be 'contributory' or causally relevant to some effect if none would be causally sufficient on their own and yet all are needed to produce the effect in question. The full cause, on the other hand, may be made up of many partial causes to form a set of total factors that produced the outcome.

Partial existential dependence seems analogous with a contributory cause. Take the claim that *water depends on* H_2O. Two hydrogen and one oxygen form the complete dependee for the existence of water whereas a single Hydrogen is an incomplete dependee for the existence of water. In other words, it is not sufficient on its own to make or build a water molecule. At any one moment, there are almost endless instances of water molecules depending on hydrogen and oxygen, giving a huge number of water dependencies – one for each case of H_2O - which is far more than we need for ordering the hydrogen and oxygen at the atomic level below the chemical compound at the molecular level. Although more than what is needed to be sufficient for the existence of water, the many water dependencies form the total set of factors for the existence of water even though each H_2O is sufficient on its own. This comparison here shows that existential dependence and causal relations may both act as full or partial builders since they are both conceptually intertwined in the important metaphysical phenomena of making and building.

[80] An example adapted from Schaffer, "Grounding in the image of causation." 56.

2.3 The analogy with causation: External connection to objective explanation

Both causal relations and relations of existential dependence feature in our explanations without being identical to those explanations. For example, explaining why the window is broken involves citing the cause of its breaking and explaining why singleton Socrates exists, involves citing the existence of Socrates the man.[81] Schaffer has claimed that these relations are of the few that can 'back' explanation by telling the 'causal' story behind the occurrence of an event[82] and similarly, existential dependence relations tell the 'dependence' story behind the existence of an object.

In the 'backing theory' of explanation, explanations are representations such as arguments, models, sets of sentences/propositions, and an instantiation of relations over them. For a representation to be an explanation it must provide information about some mind-independent relation connecting parts of the world. Thus, this requires real dependence relations such as causal dependence, composition, grounding, and existential dependence, to be responsible for connecting entities. All explanations must be backed by these dependence relations joining things in the world. Kim writes,

> A realist about explanation believes that some objective relation between the events underlies, or grounds, the explanatory relation between their descriptions. That is, statement *G* constitutes a correct explanation of statement *e* in virtue of the fact that a certain relationship obtains between events *g* and *e*. What could such a relationship be? One strong traditional favorite of course is the causal relation.[83]

So, for some explanation, *G* is the correct explanans of *e* because *g* is a cause of *e*. According to Lewis, explanations of individual events are always causal explanations. For Lewis, every explanatory claim is a causal claim and what makes an explanation of *e* in terms of *g* a correct explanation is the fact that an appropriate causal relation obtains between *e* and *g*. Further, the given explanation is informative as an explanation to the extent that it is informative

[81] Wilson, "Metaphysical Causation." 723-724.
[82] Schaffer, "Grounding in the image of causation." 58.
[83] Jaegwon Kim, "Explanatory Knowledge and Metaphysical Dependence," *Philosophical Issues* 5 (1994). 57.

about the causal history of *e*.[84] We can extend this type of thinking to dependence relations of various kind as those which serve as the objective correlates of explanations where dependence relations relate events, states, facts, properties, entities and objects.[85] For instance, where wholes depend on their parts, the properties of the whole may be explained by the properties had by its parts. Dependence relations are the basis of a world as a system with structure, not merely an agglomeration of disconnection. These relations, given their logical properties like asymmetry and transitivity generate structures of dependent events, states and properties. Moreover, their ontological contribution is that they reduce the number of independent events, states, facts, and ties we need to recognize. This is their powerful role in terms of explanations; dependence relations enhance unity by generating structure that we are able to track with explanatory reasoning.[86] For this reasoning to be correct, we must surely require that there be some sort of objective relationship between those things that feature in our explanatory facts and those that features in the fact-to-be-explained.[87] An attractive feature of this backing conception is that it implies that not all explanations are causal whilst avoiding an implausible pluralism about explanation.

The backing theory comes out of the Ontic conception of explanation which is prominent in philosophy of science and largely props up the connection between scientific realism and explanation. For those disciplines that rely on indispensability arguments to justify realism about some entities, claiming support for ontological commitment to *x* by pointing to *x's* explanatory indispensability, the ontic conception allows one to forge a powerful connection between explanation and ontology.[88] The reason for this is that the ontic conception of explanation appeals to dependence relations in the actual world which in turn support what objects are indispensable to our theories. Saatsi frames this basic idea behind an ontic conception of explanation in terms of the fact that explanation is a matter of situating the explanandum within a broader ontic framework of the world. Explanatory power derives

[84] David Lewis, "Causal Explanation," in *Philosophical Papers Volume II* (New York: Oxford University Press, 1987).
[85] Kim, "Explanatory Knowledge and Metaphysical Dependence.".67
[86] Kim, "Explanatory Knowledge and Metaphysical Dependence." 68.
[87] Wesley C. Salmon, *Scientific explanation and the causal structure of the world* (Princeton, N.J: Princeton University Press, 1984).13.
[88] Juha Saatsi, "On the 'Indispensable Explanatory Role' of Mathematics," *Mind* 125, no. 500 (2016), https://doi.org/10.1093/mind/fzv175. 1046.

from stating some relevant worldly facts which might include objective causal or mechanistic facts, nomological facts, statistical relevance relations, or whatever ontic structures can bear an objective relationship of explanatory significance to the explanandum. Explanatory relevance is a matter of exhibiting some kind of dependence of the explanandum on the explanans, in the way 'difference-making' relations do in the paradigmatic case of causal explanation.[89]

Causation and existential dependence may only truly vary in their role in explanations in terms of the object, events or subject matter they relate, thus under the backing theory and ontic conception of explanation, there is further support for an analogy to be drawn between the two relations.

2.4 Counterfactual analyses for causation and existential dependence

So far, there is a suggestive analogy between causation and existential dependence in the context of their sharing in logical properties, similar roles in backing explanations and in the way in which they act as 'building' or 'making' relations. These features can be put to good use in determining the formal treatment of these structuring relations. But what kind of causal account should we draw on, that is fit to inspire a definition for existential dependence? Given that causes do not guarantee their effects and effects do not necessitate specific causes, all causal models will be much weaker than what we need for existential dependence. Accounts of causation provide general structural features to account for a sense of regularity and the role causes and effects play in explanation, however they allow for there to be a great deal of causes that might lead to their effects and yet, circumstances where causes occur but effects do not. It is generally true that wet pavements cause people to slip and yet there are plenty of wet pavements with no people slipping and people slip on dry surfaces too – or perhaps they slip when pavements are wet and yet the loss of friction from water was not causally relevant to the fall in that instance.

These expectations do not overflow to existential dependence where the existence of a dependee should always occur when the dependent exists and be a very specific object in the case of rigid dependence. In cases of generic-kind existential dependence, there must be

[89] Saatsi, "On the 'Indispensable Explanatory Role' of Mathematics." 1052.

instantiations of things of that kind that is dependent whenever that kind exists. If we did treat causation as though it required something more like the necessitation we require for existential dependence, then very few of our intuitions about what things are causes would be met. There are numerous ways in which accounts of causation allow for failures of causes to be followed by their effects; on probabilistic accounts there are cases in the actual world where effects do not occur or, on counterfactual accounts, there may be distant possible worlds where the effect does not counterfactually follow from the cause.

Causes do not produce their effects in the same way that dependent objects inherit their existence from their dependees. It is possible that there is a world with all the same causal relata as our world and yet different actual causal relations hold.[90] The same is not true for existential dependence. It is true that both causation and existential dependence license counterfactuals: if *c* causes *e*, then $\neg c > \neg e$; likewise, if *x* depends on *y,* then $\neg y > \neg x$. However familiar cases of preemption do not guarantee that the effect would not have occurred without the cause and similarly, cases of redundant existential dependence will make necessary co-existing objects appear counterfactually related when there is no counterfactual dependence between them. We are familiar with the problem that the existence of an entity can be modally tied to that of another even if the latter does nothing to bring about the existence of the former. Even if the counterfactuals do hold for existential dependence, for example where {Socrates} $\propto$ Socrates, the counterfactual is: *If Socrates had not existed, nor would have Singleton Socrates*, there might in fact fail to be dependence because of the undesirable truth of some additional counterfactuals that come along with it. Since dependence is usually asymmetric a simple counterfactual account of dependence should induce the failure to hold, of the corresponding reverse counterfactual: *If Singleton Socrates had not existed, Socrates would not have existed either*. However, many reverse counterfactuals in the case of dependence seem equally as plausible, or nearly as plausible, as their counterfactual counterparts. Wilson explains that reverse dependence counterfactuals do not track back in time from claimed cause and then forward again to the effect. Rather, they track down in the 'order of being' from the alleged dependee and then back up to the dependent.[91] Lewis argues that back-tracking counterfactuals are marked by a 'syntactic

[90] Bernstein, "Grounding is not Causation." 26.
[91] Wilson, "Metaphysical Causation." 736.

peculiarity' when used in a context that makes them appear true. Their usual subjunctive conditional constructions are readily replaced by more complicated constructions: "If it were that . . . then it would have to be that . . . " .[92] This feature is also had by down-tracking counterfactuals in the case of existential dependence. The reverse dependence counterfactuals seem idiomatically posed with the more complex forms Lewis refers to[93] such as *If Socrates's singleton had not existed, then it would have to have been that Socrates didn't exist.* Counterfactuals are perhaps less relevant when posed in these more complicated forms for consider the moral case where, '*if act A had not had the best consequences, it would have had to have not been right'* which seems to introduce a complication that is irrelevant to the thought being expressed. Satisfactory counterfactual analyses must provide an intuitive, informative and non-ad-hoc characterization of the right-tracking counterfactuals.[94] Wrong-tracking counterfactuals will undermine the relevant counterfactuals however will not necessarily undermine our intuitions about the claims of causation and dependence themselves, in question. Even though a counterfactual analysis for existential dependence is not a successful contender, this connection between the limitations of counterfactuals may at least further bolster the analogy between causation and existential dependence.

2.5 Causes as parts of sufficient conditions

It seems now that we need a framework with some stronger modal connection between the relata than what is on offer from counterfactuals or probabilistic accounts of causes. However, a necessary connection at the level of possible worlds, yields the problem of too many objects entering into our dependence relations and of course, a necessary connection between causes and effects is not going to capture the nature of everyday causes. Perhaps, then, we ought to consider that a cause might be only a part of a whole state or condition that is sufficient to bring about the effect. We know that a cause c cannot be necessary for the effect e, for then $\neg c > \neg e$ would not allow for effects that have a range of causes or cases where effects do not follow their causes. The cause may then, be only a

[92] Lewis, "Counterfactual Dependence and Time's Arrow." 458.
[93] Lewis, "Counterfactual Dependence and Time's Arrow." 458.
[94] Wilson, "Metaphysical Causation." 737.

necessary part of what was sufficient for the effect. In fact, we find Lewis raising this possible interpretation of a regularity account of causation when he writes,

> We allow a cause to be only one indispensable part, not the whole, of the total situation that is followed by the effect in accordance with a law. In present-day regularity analyses, a cause is defined (roughly) as any member of any minimal set of actual conditions that are jointly sufficient, given the laws, for the existence of the effect.[95]

Lewis' primary concern with this view is that regularity analyses of causation tend to confuse causation itself with other kinds of causal relations. For instance, if a cause *c* belongs to a minimal set of conditions jointly sufficient for an effect *e*, given the laws of nature, then *c* may well be a genuine cause of *e*. However, it might be the case that *c* (as part of a minimal set of conditions jointly sufficient for an effect *e*) is an effect of *e* that could not have occurred other than being caused by *e*, given the laws and some actual circumstances that hold. *C* might even be an epiphenomenon of the causal history of *e* or, *c* might be a preempted potential cause of *e* – something that did not cause *e* but that would have done so in the absence of whatever actually was the cause of *e*.[96] If we say that a cause is only a part of a complex condition that brought about the effect, then how do we determine which part was, in actuality, *the* cause?

The idea to treat a cause as a part of a minimally and jointly sufficient set of actual conditions was brought to life by John Mackie in his account of causes as INUS conditions in *The Cement of the Universe*.[97] According to Mackie, a cause is an insufficient but necessary part of a condition that was unnecessary but sufficient for the effect. This account suffered Lewis' worries about distinguishing the causes from what were labeled 'background' conditions and spurious correlations that would make many doubt its success as a framework for causation. I will discuss this problem in more detail at a later point. Further, the rise of probabilistic accounts of causation, preferred over deterministic accounts made even less room for guaranteed effects, particularly when the cause was not even totally sufficient on its own.

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[95] Lewis, "Causation." 556.
[96] Lewis, "Causation." 557.
[97] J. L. Mackie, *The Cement of the Universe*, ed. L. Jonathan Cohen (Oxford, UK: Oxford University Press, 1980).

Interestingly, many of these issues may not surface as problems for existential dependence when the dependee is framed as an INUS condition for the existence of the dependent. For instance, we may not want to draw distinctions between things that are dependees and those that are background conditions when we are interested in what something depends on. Rather, whole states are required for the existence of objects. Thanks to some differences between causation and existential dependence, we may draw on our analogy to justify taking inspiration from accounts of causes and yet here we depart from causation in that we can deal with the problems that are unique to it when using this framework to build an account of existential dependence. In taking action towards this aim, the first step is to take a closer look at Mackie's proposal. This will be followed by the problems the INUS condition faces as an account of causation and how these issues do not present as concerns for existential dependence.

2.5.1 J. L. Mackie's INUS condition

In response to the problem of preemption, Mackie sought an account of causes that could distinguish between actual causes and back up causes. The stand out problem for the counterfactual account, as put by Mackie, is that while we can admit that the striking of the match caused the appearance of the flame, even if the match had not been struck the flame would still have appeared, had the match been touched by a red hot poker.[98] In a case such as this, there is a problem for capturing the difference making intuition with the counterfactual conditional. The handling of cases of preemption is the most notorious difficulty for the simple counterfactual account of causal claims since cases where had the actual cause not caused the event, then some other 'back up' cause would have led to the event instead.[99] Where we might have been inclined to draw on the distinctions of full and partial making, in which case, for cases of pre-emption, both the actual and back up cause are capable of making the effect unaided and result in competing total causes, Mackie's account aimed to avoid this issue completely. Instead, one condition is sufficient for making another obtain such that we no longer think of one whole event or object 'making' another. His austere logical framework does not say anything about what does more or less of the

[98] Mackie, *The Cement of the Universe*. 31.
[99] Some like Robert Northcott argue that there are some pre-emption cases in which causal intuition does not go against the counterfactual theory.

work in bringing about an event by only employing the single notion of a minimal sufficient condition.

What, in Mackie's view is a cause? Here is a helpful example, provided by Mackie, to illuminate his theory further. Suppose a fire burns down a house entirely. Investigators determine it was caused by an electric short circuit in a particular part of the house. According to Mackie, they must **not be saying that:**

i. The short circuit was a necessary condition for the fire – any number of other things could have set the house a light.

ii. The short circuit was a sufficient condition for the fire – there needed to be flammable material nearby such as for instance, air and the absence of a sprinkler nearby.

So how could the short circuit have *caused* the fire if it is neither necessary or sufficient for it? According to Mackie it may be said to have caused the fire if:

iii. There is a set of conditions – including the presence of flammable material and absence of sprinklers which combined with the short circuit, constituted a complex condition that was **sufficient** for the house catching fire.

Of this complex condition, the short circuit was an indispensable part – the other parts of the condition conjoined with one another, would not have produced the fire. Thus:

iv. The short circuit is an indispensable part of a complex sufficient (but not necessary) condition for the fire.

The supposed cause of the fire is (and is known to be) an *insufficient* but *necessary* part of a condition which is itself *unnecessary* but *sufficient* for the result. This is Mackie's INUS condition.[100]

[100] Mackie, "Causes and Conditions." 245.

Initially, we can see that Mackie's framework handles the fact that causes are neither necessary nor sufficient for their effects. Effects may have many causes and that what we may call the 'cause' may not be sufficient on its own to bring about the effect. Here is another example from Mackie, so that we may look at this approach a little closer. Let us say that *in the circumstances*, the blow of a hammer caused the chestnut to become flatter, so the blow of the hammer is an INUS condition for the chestnut becoming flatter. In practical discourse, where *c* is said to cause *e*, *c* is never in itself sufficient for that *e* or even believed to be so. Adding the qualification 'in the circumstances', means holding fixed some background conditions such that in all worlds with these circumstances or background conditions, the blow of the hammer will be sufficient for the chestnut becoming flatter.

We can form a conjunction such as *ABC* that represents a condition that includes the hammer's blow, *A*, which is sufficient but not necessary for the chestnut becoming flatter - we will call this event, *P*. More precisely, *ABC is a minimal sufficient condition for P* if none of its conjuncts is redundant. This means that all conjuncts are either the cause or, some background conditions that ensure that in all worlds where they obtain, the hammer's blow will lead to the flattened chestnut. Anything that did not contribute to this outcome or would have made no difference to the effect if it had not been present, would be redundant. Further, no mere part of the conjunction such as *AB* is itself sufficient for *P*. Nor can each single factor such as *A*, be a necessary or a sufficient condition for *P* - yet Mackie claims we know that *A*, what we call the cause, is clearly related to *P*, in an important way. If we have all conjuncts present in a certain circumstance, then the effect of the flattened chestnut will occur, and the hammer will be an INUS condition for the effect.

Since the striking of the hammer will not be necessary for the chestnut becoming flatter either, then there must be other minimally sufficient conditions that could bring about the effect. Perhaps, in some other circumstances, the chestnut is run over by a truck or sat on by a very heavy person and these too may be causes that are, in the circumstances, INUS conditions for the flattened chestnut. Thus, there will be a finite set of assemblages of conditions that produce *P* such as *ABC*, *DGH* and *JKL*. It may well be that *P* occurs only when at least one of these conjunctions has occurred just prior to *P* and in the right region. For instance, if the heavy truck is present on the road where the unharmed chestnut lies and

is on route to drive over it, then this will be just as much sufficient for its flattening as if it were to be smashed by the hammer. If this is so, all *P* are preceded by (*ABC* or *DGH* or *JKL*).[101] Now, we have a pair of roughly converse universal propositions:

'All (ABC or DHG or JKL) are followed by P'

'All P are preceded by (ABC or DHG or JKL)'.

The complex formula above (*ABC* or *DGH* or *JKL*) represents a condition that is both necessary and sufficient for *P*. These complex conditions are each mutually exclusive such that where *ABC* contains the event of the hammer's blow and *DGH*, the event of the truck's travelling over the chestnut, both cannot occur, nor can both contain the actual cause. If background conditions *GH* were to hold, we could not expect the chestnut's flattening to be caused by *A*, the hammer's blow, but if all *ABC* do obtain, then *A* is an insufficient but necessary (or non-redundant) part of an unnecessary but sufficient condition for the effect – it is an *INUS condition.*[102]

Now, returning to the problem of pre-emption, what is Mackie's response to when there is a 'back up' cause such that the action of the actual cause does not make any genuine difference to the occurrence of the effect? Mackie asks us to consider Smith and Jones who commit a crime, but if they had failed, the head of the criminal organization would have sent other members in their place to perform it instead – ensuring the crime would have been committed. We cannot say of either of the candidates for the role of cause that it was necessary in the circumstances for the effect – if the cause had not occurred, the effect still would have. But while we can give a causal story about the initial cause, we cannot complete the causal story about the rival**.** What we accept as causing each result, though not necessary

[101] As established earlier, there is no logical necessity that this should be so. An event might occur in a disordered way such that P might sometimes occur without there having occurred an assemblage of conditions which is always followed by P just before P in the right region.

[102] Mackie, *The Cement of the Universe*. 62. In essence, Mackie borrows Mill's "whole cause" idea, but drops the implausible idea that "cause" strictly refers to the "whole cause". Instead, he makes "cause" refer to a part of the whole cause, one that satisfies the special conditions.

in the circumstances for that result described in some broad way, was necessary in the circumstances for the result *as it came about*.[103]

Just like where the fact that the match was not touched by the poker is *necessary* for the cause having been the event where the match was struck, the fact that the crime was not committed by the backup criminals is necessary for Smith and Jones having been the cause. The circumstances included that no back up criminal completed the crime, and that Smith and Jones were in fact the cause. The same circumstances could not have, in conjunction with the backup criminals, produced the results in some nearby world. This is not to say that the backup criminals could not have been the cause in difference circumstances – they would have been sufficient to cause the crime but only in conjunction with the conditions that Smith and Jones did not do it. Both parties and their relevant circumstances may have been necessary and sufficient for the crime but as it actually occurred at the hand of Smith and Jones, we can only say that there were a set of factors, collectively called 'conditions' which were in the circumstances, jointly sufficient and severally necessary for a certain result and which all occurred, as consequently did the result.

2.5.2 Distinguishing causes from background conditions

As we are interested in making use of the INUS framework for an account of existential dependence, it is now time to look at whether there might be some problems for this account of causation that transfer to existential dependence. Mackie's account appears to handle the problem of pre-emption and indeed, it was primarily designed to do so. Backup causes are simply not necessary parts of sufficient conditions for effects as they actually happen. Existential dependence it would seem does not share any similar concerns to the problem of preemption. Even a minimal commitment to an object having its parts or properties essentially will mean that no object will have its existence 'pre-empted' by some back up dependee such that it would no longer be that object due to actually depending on something else. We will never be uncertain about what an object depends on in the way we may be in terms of what may be a cause if there is a backup because dependent objects are

[103] Mackie, *The Cement of the Universe*. 34.

tied to the objects they depend on by essentially being a certain way such that if they exist they must have certain properties and be of a certain kind.

The main worry for the INUS framework and perhaps central to its lack of popularity is the issue of how to distinguish causes from background conditions. Mackie tells us that we know the supposed INUS condition, *A*, is related to the effect, *P* in an important way, but he gives no reliable criteria for how we can be sure which of the conjuncts is the cause and which are mere background conditions. To determine which conditions are background conditions for a certain effect, we could apply a counterfactual test $\neg e > b$ which will mean 'if the effect hadn't happened, then (still) b which suggests it is a background condition, that holds throughout the nearest worlds. Counterfactually causally relevant factors are those that are in all worlds while in some of those worlds we do not have the cause itself. We know we can identify a cause if we can get rid of causes in nearby worlds such that the cause is what makes the difference against the background conditions that our world shares with all similar ones. But how do we know that this is a background condition needed for a certain cause to be the INUS condition in the circumstances? On Mackie's view it seems impossible to differentiate between causes and background conditions because causes have no special syntactic features that would allow them to stand apart from background conditions. Since no cause can be sufficient on its own for the effect, logically and structurally, when we remove anything from the assemblage of conditions it will appear as though we are removing the cause. Mackie refers to compound event names as complex events such that if *A*, *B*, and *C* are "simple events," then *ABC* is a complex event. But precisely how are we to understand these compound event names and the "complex events" they are supposed to refer to? Take the simple events *A*, *B*, and the complex event *AB*. What is the nature of the conjunction in *'AB'*? Jaegwon Kim is certain that this cannot be understood in the sense of the usual logical conjunction.[104] Mackie is explicit that *'AB'* is a sufficient condition of *P'* is not to be taken in the sense of *'A* is a sufficient condition of *P* and *B* is a sufficient condition of *P'*. We cannot treat the conjunction *ABC* in the usual sense of the sentential connective such as John and Jess like running which means John likes running AND Jess likes running. The conjunction that makes up the INUS condition seems to be something else and there is no object that

[104] Jaegwon Kim, "Causes and Events: Mackie on Causation," *The Journal of Philosophy* 68, no. 14 (1971). 430.

corresponds to the INUS condition A along with other conditions *BC* to form the minimally sufficient condition. Not only is it the case that every causally relevant factor may well be an INUS condition since they play a role in bringing about the effect in an indiscriminate way, but we also have trouble understanding the linguistic and ontological framework behind events 'glued' together in this way. If they are some kind of fusion of events, then we continue to face trouble when trying to draw out the cause as the INUS condition. The counterfactual test does not work here because if the effect had not happened then the entire conjunction of causes and conditions will not have occurred either. Anything that is in the background is the circumstances in which the effect occurred meaning we get no way of distinguishing them every time the effect happens in all worlds where it happens. By the lights of Mackie's framework, we have no criteria for why the short circuit is the cause of the fire as opposed to the oxygen or flammable materials that were also needed to bring about the effect that was the house burning down.[105]

In the context of existential dependence, this problem does not surface. When we are interested in what an object depends on for its existence and its essential properties, we do care about all relevant factors that contribute to the states of affairs that obtain when there is a dependence relation between two objects. Whatever conditions constitute the state that is sufficient for the dependee's existence, are those which must hold in all worlds where the state for the dependee obtains. We can say how the complex condition is functionally related to each conjunct then, by treating the conjunction as the fusion of whatever is required to make up the minimally sufficient condition for the dependee, over which we collectively predicate. Mackie himself may be suggesting something along these lines:

[105]Mackie does argue that when we make causal claims in ordinary language, causal statements are commonly made in some context, against a background which includes assumptions of some sort – Mackie calls this a causal field. The field will contain the cause and effect as distinct events and whatever is needed to answer the causal question. In other words, a cause is an event-in-a-certain-field in virtue of being part of the chosen field for the causal question being asked. An important step here is in drawing a distinction between the conditions and causes, in the causal field. The distinction between conditions and causes can be accounted for in two ways. Where an alleged condition which **is not called a cause**, although if in the circumstances it had not occurred then result would not have, either is:
part of the field presupposed in the view taken by the speaker of the result (and so is not a cause in relation to this field) or; is a cause but mention of this fact happened to be irrelevant or less relevant than mention of some other cause of the same result to some current purpose.

> If 'Y' represents a single conjunction of factors, then it was absent if at least one of its conjuncts was absent; if it represents a disjunction, then it was absent if each of its disjuncts was absent.[106]

According to Mackie, the conjunction of factors, *y,* requires the presence of all its conjuncts such that it would not be a minimal sufficient condition for the fire if say, there was no presence of oxygen. Contrastively, distributive predication commits a speaker to relatively concrete statements about the state of the world and if a plurality distributively holds for some property, then each member has that property. Consider size and shape predicates such as 'the boxes are big' or 'the balls are round'. These instances of predication are thought to communicate something about the individuals.[107] Collective predication admits much broader understandings of collective interpretations. This is something we do all the time, consider 'the children lifted the piano' or 'the children surrounded the tree' – clearly in neither case is each child individually lifting the piano or surrounding an entire tree. So, for our purposes here, the members of the minimal sufficient condition are collectively sufficient for existential dependence. When we say that '*x* depends on *y'*, in referring to *y* we are collectively predicating over everything in the states of affairs which is minimally sufficient for *x.* The functional relation between the complex condition and each conjunct is one by which each conjunct collectively fills the description of the role of the relata in the dependence relation. The so-called 'complexity' of the complex condition pertains not to objects themselves but to object descriptions. One might still worry that there is no strict correspondence between the complexity of a compound object name and the plurality designated by it. Consider that *A* is the same object or event as $A\neg B \vee AB$. Generally speaking, the orthographical features of an object's description are not a reliable indication as to the ontological structure of the complex object it describes, nor should we expect the complexity of the description of an object to be an indication of the complexity of the object described. However, I shall leave things as they stand as it is a broader problem for everyone interested

[106] Mackie, "Causes and Conditions." 247.
[107] Roger Schwarzschild, "Plurals, Presuppositions and the Sources of Distributivity," *Natural Language Semantics* 2, no. 3 (1993-1994). 202.

in fusion as to whether the description of pluralities reflects the underlying ontological structure of the object described by the sum of its parts.

An important reason that existential dependence relations do not need to rigidly pick out conditions is that, unlike causation, there is nothing in existential dependence relations that we might intervene upon by way of 'effective strategies' in order to alter the outcome. When concerned with the 'effectiveness' of certain strategies in obtaining particular goals, we are generally seeking information about the probabilistic features of a causal relation given that the cause is something we might alter to change the probability of the occurrence of the effect. Nancy Cartwright has championed the view that there is a natural connection between causes and strategies that should be maintained such that if one wants to achieve a goal, it is a good strategy to introduce a cause for that goal. [108] For instance, where we think *smoking causes lung cancer,* the difference between smoking and stopping smoking's effect on the likelihood of developing cancer is determined by causal laws. Causal laws ground the distinction between effective strategies and ineffective strategies for promoting a certain outcome. For example, spraying oil on the swamps in Nicaragua was an effective strategy for stopping the spread of malaria because there is a causal law that connects the events of spraying oil and the suffocation of mosquito larvae.[109] For causes there is a relevant state of affairs I am in when I decide whether to smoke or not, and, at the time of the decision I intervene on something that will influence the chances of developing cancer. When we turn to conditional probability which is a measure of the likelihood of one event occurring given that another has occurred, an increase in conditional probability is a sure mark of causation. Then it seems plausible that conditional probabilities are the right measure of effectiveness.[110] Imagine we want to know whether a certain chemical is effective for killing a poisonous plant such that the relevant strategy state is a poison plant is sprayed with the chemical. On the above characterization, the chemical is effective just in case the probability of a plant's dying, given that it has been sprayed, is greater than the probability of its dying given that it has not been sprayed.[111]

[108] Nancy Cartwright, "Causal Laws and Effective Strategies," *Noûs* 13, no. 4 (1979). 429.
[109] Cartwright, "Causal Laws and Effective Strategies." 420.
[110] Cartwright, "Causal Laws and Effective Strategies." 431.
[111] Cartwright, "Causal Laws and Effective Strategies." 429.

Causal laws pick out the right properties to condition on which are those we can intervene on. The effective strategies will range over all and only the causal factors for some effect.[112] If there is a high conditional probability of a fire starting once a short circuit has occurred then there is a causal law that indicates that short circuits are good effective strategies for giving rise to fires. One could manipulate the conditions for the fire like inducing the short circuit in order to bring about the fire or, at least increase the conditional probability of there being a fire which might aid in explaining why we do think that the short circuit is the cause without it being necessary and sufficient for the fire. This connection between causal laws and effective strategies may have been the source of those intuitions that Mackie suggests we have for knowing the cause from the background conditions, although he does not explicitly spell this out. Existential dependence does not share this connection to effective strategies. There is no distinction we can draw between things we could intervene on and those we could not, in order to determine the necessary part of a sufficient condition for the existence of an object. Existential dependence is simply not tied up with any laws that resemble conditional probability nor is it connected to effective strategies such that we could pick out the existence of the dependee as the sole condition we could intervene upon to determine the existence of the dependent object. Whatever is an INUS condition for the existence of an object will be the actual possible sufficient condition that necessarily contains what it depends on such that there will be no need to distinguish between INUS conditions and background conditions. There may well be debate about exactly where to draw the line in terms of what is included in the complex conditions that are the minimal states of affairs needed for the existence of a dependent object. For example, should we include in the complex condition, the laws of nature? And if so, what difference would it make, if any? Disagreement over such an issue, however, might be attributed to differences in the metaphysical theories adopted by philosophers more broadly.

2.6 Concluding remarks

Similarities between causation and existential dependence give us reason to think that some frameworks for causation might be useful in developing an account of existential

[112] Cartwright, "Causal Laws and Effective Strategies." 432.

dependence. Indeed, there are similarities that suggest we can draw an analogy between the two relations that I think are relatively uncontroversial. For one, these relation share in their logical properties such that they may impose a strict partial ordering. Similar paths have been followed when challenges have been raised to these properties so that perhaps they are at best, both only a partial ordering. We may also think their roles in 'building' or 'making' events or objects are alike in that causes and dependees might build or make on their own or in conjunction with other events or objects. Our analogy is bolstered further when we consider the family of relations that back objective explanation of which both causation and existential dependence are a part. Since the limits of counterfactual analyses mean that counterfactual conditionals will not distinguish between actual dependence relations and mere co-existing objects, we must look elsewhere for an account of causation that might be suited to inspiring a useful modal framework for existential dependence. It may surprise the reader that I have turned to an unpopular account of causation that was presented as a regularity analysis of singular causal claims by John Mackie. However, I think we can ask whether Mackie really had causation, and not existential dependence in mind when he formulated his INUS framework. When applied to causation, Mackie's INUS framework does not actually do the work of promising to identify the actual cause from background conditions. It is one of the most salient features of his account that it promises to be able to treat cases of causation as they actually come about, bypassing any need for determining necessary and sufficient conditions and accommodating the fact that we can have effects that have a whole range of possible causes. The framework Mackie gives promises to give us some logical foundations for determining a cause based on the cause being entailed in a condition that is minimally sufficient for the effect. We are meant to know the cause as something that is non-redundant in bringing about the effect because removing it will violate the entailment and, in those circumstances, the effect will not occur. But without a strong heuristic for ruling out background conditions as things that also play an essential role in the entailment relation, which is so easy to do, we cannot ever be sure that background conditions are not causes too.

On the other hand, if a dependent object is a necessary part of a sufficient condition, then we are able to apply this to parts of states of affairs that are sufficient for the existence of dependent objects. We do not have to worry about dependence relations being pre-empted

by alternative dependees nor do we have the problem of drawing out the dependent object from a range of background conditions that might compete with the dependee as an INUS condition. Most importantly, the INUS framework looks like a promising option for a renewed modal account of existential dependence that can deal with cases that need a finer-grained approach than at the level of total conditions. Where Mackie's theory fails as a theory of causation perhaps, he was thinking of causes in a context more akin to existential dependence and now, we have a theory that seems poorly suited to causation but right for a renewed modal interpretation of existential dependence.

Next, I shall present the INUS framework in the context of existential dependence and show how I intend to make use of it in defining the relation. There is one more problem that carries over to dependence that I have not yet explored here. That is, the issue of spurious non-redundancy that results from over reliance on the entailment relation that is so crucial to the INUS framework. But as we will see, this is not unique to causation. We have seen this already in our objections to the traditional modal account of dependence and will look at how to make use of *parts of sufficient conditions* in solving this in the next chapter.

3. The INUS Condition for Existential Dependence

> "A crucial notion in metaphysics is that of one object *depending for its existence upon another object* – not merely in a causal sense, but in a deeper, quasi-logical sense."
>
> Lowe (1994) p. 31

3.1 Introduction

In chapter one, we discussed problems for traditional accounts of existential dependence. In particular, the modal-existential account trivialises dependence in the presence of necessary entities, and is unable to capture asymmetries of dependence non-trivially between necessarily co-existing entities. As is well-known, these problems generate a need for a more fine-grained analysis. Adopting other available options found in the literature, such as for instance, essential dependence, comes at the cost of positing unclear ideological primitives. To establish a successful existential analysis of dependence then, we need to look elsewhere for a useful framework.

In searching for a new avenue, we saw that an analogy can be drawn between causation and existential dependence since they share in internal structure and external connection to objective explanation. This analogy has been drawn upon in the grounding literature on several occasions so that approaches to an analysis of grounding can also make use of frameworks that have been successful in the case of causation. So, in chapter two, I concluded that structural parallels give us reason to think we might look to an account of causation to develop a more suitable account of existential dependence. In this part of our inquiry, it became clear that the simple counterfactual account of (deterministic) causation and existential dependence shared in the issue that counterfactual accounts over-generated incorrect cases of reverse counterfactuals. Now, this could be corrected with alternative accounts of causes but the same cannot be said for existential dependence. Like almost all accounts of causation, the counterfactual account is too weak to provide the necessary connection we need between the relata in existential dependence relations.

In an often-overlooked theory of the meaning of singular causal claims, John Mackie offered the INUS condition for causation as a way of capturing the parts of a total condition

that were causally relevant to, but not necessary and sufficient conditions for an effect. His account was designed primarily, to deal with cases of pre-emption – where a cause is not necessary because a backup cause might lead to the effect instead. Mackie claimed that a cause is a non-redundant part of a condition that is sufficient to entail the effect. Although Mackie's approach was not right for causation, at least in part because we cannot tell background conditions from causes, it seems that an analogous problem will not arise for existential dependence. In this chapter, I propose an account of existential dependence inspired by Mackie's framework. Like Mackie's account of causation, my proposal is that an account of existential dependence also needs to capture parts of total conditions to eliminate irrelevant objects from entering our dependence relations.

Herein, I make a preliminary proposal in parallel with Mackie's definition (3.2) and show how this initial approach will not survive the most severe counterexamples to Mackie's theory – the problem of spurious correlations (3.3). This is the same problem we have faced for the traditional modal account of existential dependence. Reviewing this problem for the INUS approach to existential dependence will lead me to analyse necessary and sufficient conditions in terms of possible worlds so that we may locate the downfall of the initial proposal (3.4.1). It is here that I introduce situation theory as the keystone of our INUS framework for existential dependence. Situations will allow the formulation of necessary and sufficient conditions on partial structures, not only conditions at the level of whole possible worlds (3.4.2). I then turn to reformulating our definition to reflect that whenever an object exists, there must be a situation that is so minimal as to only contain the object and what it depends on. In such situations, the object will always be accompanied by whatever it depends on, and need not be accompanied by things on which it does not depend – even if those things exist at exactly the same worlds as the object. With these resources, we are equipped with a new hyperintensional modal definition of existential dependence that does not require ideological primitives such as essences in offering a more fine-grained framework than the traditional modal account. I argue that it is not only theoretically virtuous to accept situations on the basis that they are a resource we should accept for free with our theory of possible worlds, but also that situations have been shown to be a useful resource in areas of philosophical inquiry distinct from metaphysics (3.5). Finally, I show that the INUS-situations framework of existential dependence does answer for our intuitions that we should

deny claims that singleton sets, and their sole members existentially depends on one another (3.5.1). By drawing on Lewis' and Penelope Maddy's various approaches to set theory, I argue that we are justified in claiming that there is a situation with the set and the member when the set exists, and a minimal situation that only need contain the member for its existence. Importantly, this final exercise shows that we do not need additional theories about objects to know what they depend on. Rather, our theories themselves determine the contents of minimally sufficient situations in which we will find a qualitative specification of objects and what they depend on.

3.2 A preliminary proposal: INUS condition for existential dependence

Having explored reasons why we could utilize Mackie's INUS condition for causation as the foundation for a new modal account of existential dependence and why we do not share worries about this approach that are unique to causation, we can now establish an initial proposal. INUS conditions relate conditions like events or states of affairs, not objects directly so I shall formulate our definition with the incorporation of states of affairs in gerund clause form. My preliminary principled definition of existential dependence is this:

> **(D1)** *x* depends for its existence upon *y* $=_{df}$ necessarily, «*y*'s existing» is an INUS condition for «*x*'s existing».

This is the simplest formulation of a definition of existential dependence in terms of the INUS framework and parallels Mackie's INUS condition for singular causal claims. Simply this definition claims that for *x* to depend on *y,* the state of affairs containing *y* is a necessary part of a condition that is sufficient for the state of affairs containing *x.* Recall for a cause, *c*, if c is sufficient for e, then $\neg e > \neg c$. For example, if the condition containing the short circuit was sufficient for the fire, then if the fire did not occur then neither did the short circuit. In parallel, where *x* existentially depends on *y*; If *y* is sufficient for *x* then if the state containing *x* does not exist, then neither does the state containing *y.* For example, if a state containing atoms in Sydney is sufficient for the state containing the existence of the Sydney harbour bridge, then if the state containing the existence of the bridge does not obtain then neither does the state containing the atoms. There is a degree of contingency as to which

possible sufficient condition is the actual sufficient condition that amounts to the existence of the bridge – particularly in generic cases where objects like bridges are variably embodied. The actual possible sufficient condition is sufficient for the existence of the object and will contain whatever the bridge depends on, as a necessary part. Then, the array of possible sufficient conditions is the necessary and sufficient conditions for the bridge.

If we proceed by following Mackie so closely here, we will face the same problems as those faced by the proponent of the traditional modal account. Moreover, on this formulation of the INUS definition we uncover some of the most severe counterexamples to the INUS condition for causation that are the result of such spurious correlations due to over reliance on the entailment relation. As things stand, Mackie's project for the INUS condition does not succeed in overcoming such counterexamples. Resultantly, the first attempt of a definition for existential dependence given here will need to be revised over the course of this final chapter so in the first instance, let us examine the problems that lead us to refute it.

3.3 The problem of spurious non-redundancy

The problem of spurious correlations for the INUS account of causation gives the undesirable result that many events appear to be INUS conditions for effects to which those events bear no causal relation by appearing to be a non-redundant part of a sufficient condition for the effect. This is due to the fact that it is very easy to play a non-redundant role in an entailment relation, for instance, in the case of Mackie's own example of the Manchester Hooters.[113] In this case, the sounding of factory hooters in Manchester at the end of the workday, is regularly followed by, but does not cause London workers to leave their work since their workday happens to end at the same time as the Manchester workers. The sounding of the Manchester hooters is regularly entailed in the conditions that cause London workers to leave work and although qualifying as an INUS condition, we would not ordinarily take them to be the cause. We have the same problem for causal overdetermination where, for example, a person dies when two bullets penetrate his heart at the same time. Or two radios, turned on and tuned to the same station, begin playing the same music when the station begins its broadcasting day. There are various types of overdetermination, such as for

[113] Mackie, *The Cement of the Universe*. 81.

instance independent, simultaneous, and linked, all of which seem to threaten the INUS analysis, on the basis that these events are entailed in the conditions that contain the cause. And again, this problem surfaces where there are several effects that share a particular cause rather regularly. Consider the case where when my alarm sounds, I wake up and get out of bed. Following my alarm sounding each day however, a baby in the apartment next door starts to cry. Each day then, at the sound of my alarm, I get up and the baby cries. It cannot be my getting out of bed that causes the baby to cry because there are other occasions where the event of my getting out of bed is not followed by the event of the baby crying, nor is the baby likely to hear my getting out of bed and, even if I sleep through the alarm, the baby still wakes and cries. Even though my getting out of bed does not make any difference to whether the baby cries, these two events that are effects of a shared cause will regularly appear to exhibit counterfactual causal dependence. Some regularities persist where there is no causal sequence and the additional event of my getting out of bed will appear to be an INUS condition and thus a cause for the baby's crying.

This over-reliance on the entailment relation leads to spurious cases of non-redundancy when any irrelevant event *r* can be shown to be the cause of a given event *e* if there is a set of conditions jointly sufficient for *e*, none of which are redundant. We could replace one of the conditions *c* with the following two conditions: *r* and $r \supset c$. These new conditions are also sufficient for *c*. Then *r*, which is intuitively irrelevant cannot be removed from this set without invalidating the entailment of *e*.[114] On Mackie's account then *r* is an INUS condition for *e* and thus, *r* is the cause of *e*. If the INUS framework is to be deemed a plausible account of causes, then entailments involving irrelevant events need to be declared in some way, illegitimate.

This critical issue for the INUS framework is one we have already encountered. Recall Fine's counter examples to the modal-existential account of dependence (sec. 1.4 & 1.5). Necessary existents and necessary co-existents are entailed in states when they are in fact not the dependee. Socrates' singleton set is entailed in some conditions that are sufficient for the existence of Socrates. If the framework were to yield the correct result, that singleton

[114] Michael Strevens, "Mackie Remixed," in *Causation and Explanation*, ed. Joseph Keim Campbell, Michael O'Rourke, and Harry S. Silverstein (Cambridge, Massachusetts: MIT Press, 2007). 112.

Socrates was not an INUS condition for Socrates the man, then it would need to produce the result that there could be worlds with only Socrates and not the singleton set in the same way we expect there to be coherent worlds with the Sydney harbour bridge and yet the atoms that make up my office desk may not exist. There is no dependence of the former on the latter as my desk atoms are not a non-redundant part of a minimal sufficient condition for the bridge. As it stands, Mackie's formulation of the INUS condition does not solve the problems we wanted it to, even though I have argued it makes a far more suitable account of existential dependence than it does for causation. The problem remains for Mackie that there is a genuine but accidental regularity that the London hooters sound simultaneously with the Manchester ones. Perhaps we might then, in the case of existential dependence, restrict our attention to necessary regularities so that we may not have the problem of spurious dependency. However, the connection between Socrates and {Socrates} is non-accidental and results in the claim that some things that depend on Socrates will depend also on {Socrates}. For example, where Socrates' life depends on Socrates but not his set we still, on the INUS account get a spurious correlation between Socrates life and {Socrates}.

Mackie claims we can rule out such irrelevant events by way of a 'dependence connection' that indicates where there is causal priority of the cause leading to or generating its effect. This way, his account would be explicitly empiricist in that Mackie thought we were justified in placing some reliance upon our ordinary methods of induction or on the confirmation of hypotheses such that there are very likely regularities of the complex sort suggested by the INUS account.[115] Similarly, Strevens has suggested that we need restrictions imposed on the kinds of entailments that are fit for determining causes. A set of conditions should not only be sufficient for *e* but it must be *causally sufficient*. In this non-reductive approach, Strevens seems to propose to take the ideology of causation as primitive. A causal claim picks out a piece of the causal web essential to the production of some event *e*. The claim locates a part of the causal web that is described by a sufficient condition for *e*, and then discards those elements that are not essential to the production of *e*, the redundant parts of the sufficient condition. The sufficient condition for *e* should represent a part of the causal process that produced *e*. Many sets of conditions may merely entail *e* but fail to

[115] Mackie, *The Cement of the Universe*. 82-83.

represent any part of the process that truly caused *e*. Each step in the entailment must correspond to a strand in the relevant causal web in order to represent a causal process. The *causal entailment* locates parts of the causal network that played an essential part in the effect – parts that cannot be removed without invalidating the entailment of the effect. A set of conditions sufficient for an event *e* is *causally sufficient* if and only if it identifies aspects of the world that play a role in causally producing *e* in each of its instantiations.[116]

There is a limit to the fruitfulness of an analysis of causation that employs causal terminology when offering the theory. Our solution to the problem of spurious non-redundancy for existential dependence could follow Strevens in taking the ideology of existential dependence as primitive but this is not how I wish to proceed. While perhaps for causation we can look to the world for causal connections, we cannot extract anything about the modal dimension of existential dependence. Perhaps causes need to be physically connectible to an effect such that it will not only be facts about the geometry of space, but also the existence of some upper limit on causal signals that places restrictions on the potential causes of a given effect. Non-empty sets, on the other hand, may not in any obvious way, exhibit the features of being located where their members are in the same way in which we might rely on spacetime geometry to determine a cause. Instead, I will offer a modally reductive analysis of existential dependence without taking the ideology of dependence itself as primitive.

3.4 Necessary and sufficient conditions for existential dependence

(D1), as it stands, generates spurious correlations between objects that share no dependence relation. Does the source of this problem lie with the use of necessary and sufficient conditions? We need to explore in further detail, the way in which necessary and sufficient conditions will be cashed out in the INUS framework to locate the source of this problem. It seems that this problem, that sufficient conditions include too much in terms of what is the cause or what something depends on, may arise from our use of possible worlds to characterise conditions. This is where we will start.

[116] Strevens, "Mackie Remixed." 112-113.

3.4.1 Possible worlds

To begin here, consider the representation of states of affairs as sets of worlds. Some have preferred to treat a world as a maximal state of affairs where, consequently, a state of affairs is a partial world.[117] Here I will treat possible worlds as things that exist and follow Lewis's claim that believing in possible worlds is doing no more than believing that things might have been different in various ways.[118] Worlds are 'ways things could be' and they are conceived of as concrete particulars or they are at least entities which are made up of concrete particulars and events. Our world is the actual world and that which is actual depends on the world where the utterance is located. [119] With possible worlds available, we can model them as sets of worlds that agree with the state of affairs that is instantiated. For an object, *x,* the set of all and only those possible worlds that include *x's* existence as a part, is the state of affairs *that x exists.* Necessarily, iff *x* exists, then that state of affairs *would* obtain. The state of affairs *x exists* is what is held in common across the set of *x*-worlds which while they may differ in other ways, they are the worlds where the *possibility that x exists* would be realized. Take Lewis' example of the set of all and only those worlds that include a talking donkey as a part. This is the state of affairs *that there is a talking donkey.* It is also the proposition *that there is a talking donkey.* This set is also a way things possibly are, *that there might be a talking donkey.* It is also the possibility *that there be a talking donkey.* It is the structure *including a talking donkey.* Any concrete world picks out just those sets of worlds that have it as a member and that is what it is for a state of affairs to obtain, relative to a given concrete world – ours or another. [120] If we treat states of affairs as sets of possible worlds then this invites us to look at what necessary and sufficient conditions for the existence of objects are, as conditions upon worlds. The necessary and sufficient conditions for a state of affairs to obtain are then the relations of inclusion and subsets for possible worlds. Below is a set-theoretic formulation of necessary and sufficient conditions.

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[117] Graeme Forbes, "Worlds and States of Affairs: How Similar Can They be?," in *Language, Truth and Ontology*, ed. Kevin Mulligan (Dordrecht: Springer Netherlands, 1991). Pollock (1984, 57) also claims a possible world is a *maximal* state of affairs – but defines it differently to Forbes who uses these identity conditions

[118] David Lewis, *Counterfactuals* (Cambridge, Massachusetts: Harvard University Press, 1973). 84.

[119] Robert Stalnaker, "Possible Worlds," *Noûs* 10, no. 1 (1976), https://doi.org/10.2307/2214477. 67-68.

[120] Lewis, *On the Plurality of Worlds*. 185.

If p is necessary for q then there is no world where q without p; i.e., the q-worlds are a subset of the p-worlds:

P is necessary for Q iff $\{w$: Q is true in $w\}$ is a subset of $\{w$: P is true in $w\}$

If p is sufficient for q then there is no world where p without q; i.e., things are such that the p-worlds are a subset of the q-worlds:

P is sufficient for Q iff $\{w$: P is true in $w\}$ is a subset of $\{w$: Q is true in $w\}$

Note that P is sufficient for Q iff Q is necessary for P.

Now, if a state of affairs is represented as a set of worlds, then any two distinct states of affairs which are necessarily correlated will correspond to the same set of worlds. Such states of affairs then appear to be necessary for each other. This is how our problem of spurious correlation arises. This is a point we are familiar with from Quine claiming that objects that share in their extension belong to the class of all things of which a general term is true.[121] The set of entities that satisfy the description 'creatures with a heart' is the same set of those entities which satisfy the description 'creatures with a kidney'. Both descriptions extend to the same objects such that they are true in all the same worlds where the distinct objects exist. In this way, understanding the truth conditions of modal statements with possible worlds fails in some cases for existential dependence. For the state of affairs «Socrates exists» to obtain, there will be a set of worlds in which the proposition ⟨Socrates exists⟩ is true. These worlds will also be worlds where the singleton set exists such that the proposition ⟨{Socrates} exists⟩ is true. The INUS framework can't distinguish between these necessarily co-obtaining states. Both propositions are necessary parts of sufficient conditions for the other, any condition with one is, necessarily, a condition that is possibly sufficient for the other so on the INUS framework where necessary and sufficient conditions are determined at the level of possible worlds, they mutually depend on each other.

[121] Willard V. O. Quine, "Two Dogmas of Empiricism," *Philosophical Review* 60, no. 1 (1951), https://doi.org/10.2307/2266637.

Should we give up on necessary and sufficient conditions given that, when formulated in terms of possible worlds, they do not solve our modal problems for existential dependence? If we make use of the INUS condition for existential dependence at the level of possible worlds, we will wrongly predict that person who believes a proposition *p* should also believe any proposition that is true in the same worlds as *p*. To distinguish logically equivalent propositions, we seem to need a more fine-grained notion of what the information content of a sentence is, and the state-of-affairs of situation semantics will be used for this purpose.

3.4.2 Situations

Situation semantics, developed by Barwise and Perry, grew out of the need for a more fine-grained way of determining the information content of statements in natural language semantics. Barwise and Perry in *Situations and Attitudes* write,

> Situations are basic and ubiquitous. We are always in some situation or other. Human cognitive activity categorizes these situations in terms of objects having attributes and standing in relations to one another at locations - connected regions of space-time. Human languages reflect (and enhance) this cognitive activity by giving us a way of communicating information about situations, both those we find ourselves in and those removed from us in space and time… we recognize the epistemological primacy of situations, but follow the lead of language and take objects, relations, and locations as the primitives of our theory, reconstructing situations from them. [122]

According to Barwise and Perry, a state of affairs is a static situation that holds throughout some stretch of time.[123] A situation can be a partial structure that is a state of affairs, having objects, properties, individuals, space-time locations and relations as uniformities across them. In this sense, they are contrasted with worlds; a world determines the answer to every issue, the truth-value of every statement. A situation corresponds to the limited parts of reality we perceive, reason about and live in. It was taken as a guiding principle of the theory

[122] Jon Barwise and John Perry, "Situations and Attitudes," *The Journal of Philosophy* 78, no. 11 (1981).668-669

[123] Barwise and Perry, *Situations and Attitudes*. 49.

to be as realistic as possible about the objects of the theory, developing it out of everyday common sense, everyday things of the world, and not philosophical inventions like sets of possible worlds. Since worlds are conceived of as concrete particulars, it is easy to see that situations are parts of them. They too are spatially delineated, with all of their included elements among the elements of the larger world. Partial worlds will be the 'way some things could be' and are contrasted with the internal completeness of possible worlds. This supposition of internal completeness is required by the explanation of propositional contents as sets of possible states of the world, which is motivated by our account of the nature of representation. To represent the world just is to locate it in a space of alternative possibilities, so content should be explained in terms of those possibilities.[124] Situations, in contrast, are partial relative to each other making a world a very large situation. Some situations are part of others and distinct situations within the same model are compatible with one another. They are consistent and increasingly inclusive until they contain all the content that makes up an entire possible world, allowing us to distinguish between a partial situation and the set of all its complete extensions. Situations and their content could be understood in terms of their qualitative specification such that it will not be that some non-qualitative aspects of situations make some contribution to determining representation of them and their content *de re*.[125]

What goes on in these situations will determine answers to some issues and the truth values of some statements, but not all. Situations only need to be partial structures, allowing for states of affairs that involve some objects and properties. Consider the perceptive report 'Mary saw Jean shopping'. Mary has detected a kind of 'scene' which contains information about Jean's behaviour in terms of her shopping but no other information such as what Jean had for breakfast or whether it is raining across town. This specific scene leaves open any additional information content. To model this in terms of possible worlds would require a set of complete structures or primitive worlds each determining the truth value of every sentence expressible under the language in use. The set will be those structures that agree with the scene whereas anything that cannot be determined by the situation will be where the structure or worlds in the set disagree. A set of worlds does not provide a reliable model for representing a part of a world. While a set of worlds that all agree on *P* can represent that *P*-

[124] Robert Stalnaker, "Possible Worlds and Situations," *Journal of Philosophical Logic* 15 (1986). 118.
[125] Lewis, *On the Plurality of Worlds*. 223.

part of the world, it also represents any *Q* that is present in every *P*-world. But the *P*-part needn't be a *Q*-part. We need something that can offer a more fine-grained analysis for when a speaker thinks *p* but not *q*, even when *p* and *q* are true in the same worlds. There are a number of theoretical posits that we might utilize to replace sets of worlds with a partial structure, such as for instance facts, states of affairs, structured propositions or situations. For concreteness I will use situations, but much of what I say can be recast in other frameworks for those who prefer to make use of another sort of fine-grained entity in semantics. Now let's reformulate our set-theoretic definitions of necessity and sufficiency in terms of situations.

If *p* is situationally necessary for *q* then there is no situation where *q* without *p*; that is, the *q*-situations are a subset of the *p*-situations:

> **Situational necessity: *P* is *s*-necessary for *Q* iff {*s*: *Q* is true in *s*} is a subset of {*s*: *P* is true in *s*}.**

If *p* is situationally sufficient for *q* then there are no situations where *p* without *q*; that is, the *p*-situations are a subset of the *q*-situations:

> **Situational sufficiency: *P* is *s*-sufficient for *Q* iff {*s*: *P* is true in *s*} is a subset of {*s*: *Q* is true in *s*}.**

To say that "*p is necessary*" should be understood that *p* is true in all possible worlds. So, for any object that exists necessarily, the set of propositions that are true at any world, will include the necessary existent and will have as subsets, true propositions about other objects such that it appears as though those objects depend on the necessary existent. If mathematical truths are necessary, then all other propositions appear to share in their intension with the mathematical truth. However, since worlds are very large situations, if *P* is *s*-necessary for *Q* then *P* is necessary for *Q*. The reverse, on the other hand, is not true. All sets of worlds are subsets of the set of worlds where $1 + 1 = 2$, so that mathematical truth is necessary for every proposition. But it is not *s*-necessary, since not every proposition makes $1 + 1 = 2$

true. It is more demanding for a proposition to be *s*-necessary than merely necessary and the same applies to *s*-sufficiency and sufficiency. (On the other hand, to be s-possible – to be true in at least one situation – may be less demanding than to be possible.) If *P* is *s*-sufficient for *Q*, then every situation with *P* is one in which *Q*. Contrasting this with sufficiency, when *P* is *s*-sufficient for *Q*, *P* is not a subset of a world where *Q* is true and whatever other propositions are true in that world. Again, situations make it much harder to be a necessary and sufficient condition for an object. For *P* to be necessary and sufficient for *Q*, *P* is necessary for *Q* iff *Q* is sufficient for *P.* Where *P* is situationally necessary and sufficient for *Q*, *P* is *s*-necessary for *Q* iff *Q* is *s*-sufficient for *P*. Every situation in which *Q* is one in which *P*, iff *Q* is *s*-sufficient for *P* such that every situation in which *Q* is one in which *P*.

With this formulation of *s*-necessity and *s*-sufficiency, we can adopt a broadly modal account of existential dependence, quantifying over possible situations rather than possible worlds. Here is the final formulation of the definition:

> **(ED$_{\text{INUS}}$)** ***x* depends for its existence on *y*** $=_{df}$ necessarily, «*y's* existing» is minimally situationally sufficient for «*x's* existing».

For «*y's* existing» to be INUS condition for «*x's* existing» there must be a certain structure to the world and those situations that are actual must be those that possibly exist. The situation that is realized and suffices for *x* is such that, if *y* were removed and all other aspects of the situation remained unchanged, then the situation would no longer be a sufficient condition for *x.* This view diverges from counterfactual dependence since the necessary and sufficient conditions for *x* entail all possible situations that are sufficient for *x.* The actual situation must contain *y* as a necessary part of the possible sufficient condition that is actual. The actual situation that is sufficient for *x*, is *minimal* just in case it contains no non-redundant objects. Anything that does not contribute to the existence of *x* in the sense that it would make no difference if it had not been, is classified as redundant. The necessary and sufficient conditions will determine whether there may be other possible sufficient conditions that, should the state of affairs containing *y* not obtain, an alternative possible minimally sufficient condition may be realised in that situation.

The role which the object fills in the dependence relation has its full description met by those properties that the object instantiates in all situations in which it exists. Any two situationally sufficient states of affairs that are qualitatively indistinguishable and satisfy the same description at the level of dependees, will both be situationally sufficient for a state containing the dependent object. Situations merely consist of atoms and their fusions and the properties of their fusions meaning they each have different objects as their constituents, the representation of which, is determined by qualitative character. Whenever there is a situation with an object, there should also be the object it depends on. However, sufficient situations will contain *more* than the object and what it depends on. We need a way to identify the most minimal situations in which such objects exist regardless of whether they might exist necessarily or share in a necessary connection with another distinct object. Minimally sufficient situations are those where *only* the dependent object is realised. All situations in which the object exists, will share in common the qualitative description. Then, if we look at all the minimally sufficient situations where *x* is and identify what always accompanies *x* in all those situations, we know what *x* depends on. Whatever *x* can possibly depend on will be what *x* necessarily depends on such that in *all* situations where *x* is realised, what *x* depends on is also realised.

We can call back on some important qualifications from Mackie's proposal in terms of what INUS conditions for various cases of existential dependence may be like. Here '*X'* replaces any other conditions in the conjunction that is the actual minimal sufficient condition for *P*, and '*Y'* represents any other minimal sufficient conditions in the disjunction that is the necessary and sufficient conditions for *P*. Provided that there is a necessary and sufficient condition of *P*, the condition, *A*, is *at least* an INUS condition for *P* just in case *A* is one of the following:

i) an INUS condition (*AX* or *Y*)
ii) itself, a minimal sufficient condition (*A* or *Y*) or a component in the only minimal sufficient condition of *P* (*AX*), or
iii) by itself, a necessary and sufficient condition of *P* (*A*).

In all of i)-iii), *A* must only be at least an *insufficient* but *necessary* part of a condition that was *unnecessary* but *sufficient* for the result. Where *A* is by itself, a necessary and sufficient condition of *P*, all possible minimal sufficient situations for *P* are such that every situation with *P* is one in which *A*. For rigid cases where non-empty sets depend on their exact members, possible situations where the set is realised will only ever be those with the exact members. The possible minimally situationally sufficient conditions will only contain the exact members such that the INUS condition for the set will also be the necessary and sufficient conditions for the set. Where (*AX* or *Y*) is a necessary and sufficient condition of *P*, all possible minimal sufficient situations for *P* are such that every situation with *P* is one in which (*AX* or *Y*). For generic-kind cases like composite objects that generically depend on things that are of the kind of things that are their parts, all possible minimally situationally sufficient conditions must realise the object and anything of the kind that are the objects' parts. There is a range of situations that may contain things that are parts of *x* which are qualitatively specified by being 'parts of *x*' in all situations in which *x* exists, and yet no specific dependee needs to be realised.

3.5. Situations for hyperintensional constructions that express existential dependence claims

Existential dependence claims must forbid the arbitrary substitution of intensionally equivalent constructions like propositions that make claims about one object depending for its existence on another. With **(ED$_{INUS}$)** based on an INUS framework that makes use of situations we can meet our aim without needing to make use of ideological primitive like essences as they are understood in Kit Fine's familiar framework. We can correctly distinguish in actuality, dependence relations between objects such Socrates and {Socrates} as situations are partial worlds. A situation may be a small part of the actual world while the state of the actual world includes everything that is the case.

While I claim that situations do the work of offering a more fine-grained analysis of existential dependence relations, there are other theoretical proposals that may be options for meeting the same task. That is, they may replace the situational formulation of necessary and sufficient conditions in the INUS condition. For example, one might prefer to appeal to strictly states of affairs that are not situations, or perhaps structured propositions or, as many

have preferred essences that form the nature and definition of an object. So long as the choice can be used to form hyperintensional constructions then perhaps, these resources are available too. So why then, have I opted for situations and not one of these other available resources?

For one, situations are a natural continuation of theoretical posits we are already committed to from our theory of possible worlds. Modal notions like possible worlds have been one of the most significant philosophical resources of the second half of the twentieth century in analytic philosophy shedding new light on many metaphysical questions and helping to raise and clarify new theoretical options across the discipline. It would seem then that anyone who accepts the fruitfulness of possible world semantics should happily take the situations semantics they get for free, especially since situation semantics compliments and in no way seems to contradict possible world semantics.[126] Situations offer a more fine-grained analysis of dependence and while a situation may not need to be actually realized when the components are not fully or appropriately related in the real world or when the relata of dependence relations do not actually exist, they still consist of real objects, relations and locations. Whereas if we remained at the level of possible worlds, properties and relations are only derivate notions that are defined in terms of possible worlds and individuals. A further benefit is that while there is a difference between possible worlds and situations in terms of what they can theorize about or what they take as primitives, there is no difference in ontological commitment. Both are actual things and neither transcends the reality of the other. As Stalnaker has rightly pointed out, for states of the world, as with situations, we need to distinguish existing from being actualized, or realized, or instantiated. Possible worlds semantics excludes an analysis of the concept of a possible world, but it permits, on occasion, explanations of what possible worlds are.[127] And when these explanations treat possible worlds as real objects with parts and varying degrees of actuality - possible worlds are a lot like situations. This makes them an easy choice, simple to use and not in conflict with many of our other widely accepted theoretical posits, since they are made of ordinary objects that we already accept such as states of affairs and facts.

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[126] Jaakko Hintikka, "Situations, Possible Worlds, and Attitudes," *Synthese* 54, no. 1 (1983), https://doi.org/10.1007/BF00869468. 155.
[127] Stalnaker, "Possible Worlds and Situations." 117.

The second motivation for this choice is that there is an existing literature on the use of situations that offers what we need here - parts of worlds - that has a substantial theoretical role to play in other areas of philosophical theorising. The upshot of this, is that we are not employing a new notion or asking situations to perform a specialised task for a framework of existential dependence. We are merely giving another task to an existing resource. Our situations-based framework for existential dependence shares primitives that have proven successful in other philosophical neighborhoods such as formal semantics and linguistics where, as far as I am aware, no one has sought further commitment to anything like essences. Austin's analysis of natural language phenomena revealed that utterances are about particular situations – explaining why, in the actual world we falsely report assertions whenever we fail to consider the situations which the assertions are about. Following from this reasoning was the realization that since assertions are about particular situations then we ought to extend this to beliefs. Beliefs that are formed without considering the situations the beliefs are about, will fail to be accurately ascribed too.[128] Simply, there should be grammatical devices to track situations. Perhaps the most influential discovery in situation semantics proposed by Barwise and Perry was the use of the Austinian perspective on utterances to account for implicit quantifier restrictions and incomplete definite descriptions. In this case, Barwise and Perry claimed that a statement is true when the actual situation to which it corresponds, is of the type described by the statement.[129] Certain implicit restrictions for quantification domains are the result of the fact that assertions are about specific actual world situations which vary to the degree to which they are inclusive of parts of the actual world.

I do not deny that a very similar account to what I offer here might be developed that makes use of other tools to achieve a hyperintensional account of existential dependence in terms of the INUS framework and play the same role as situations. For instance, we might replace situations with Fine's notion of an essence in the INUS framework and yield the same results. Perhaps then, to be part of a sufficient condition for *x* is to be part of the essence of *x.* Anything that *x* does not depend on is not sufficient for it in virtue of not being part of *x's* essence. Since {Socrates} is not part of the essence of Socrates the man, then there is some part of actuality that is sufficient for his existence that does not contain the existence

[128] J. L. Austin, *Philosophical papers*, 3rd ed. (Oxford: Oxford University, 1979).
[129] Barwise and Perry, *Situations and Attitudes*. 160

of the singleton set. The nature of the singleton set requires a part of reality that contains the nature of the man, but the reverse is not the case. It might be that if *y* is *essentially* sufficient for *x* then *y* is an INUS condition for *x.* But what would we gain from this account that we would not by using situations? Essential existential dependence requires the invention of a new primitive that is not a continuation of resources we are already familiar with, and we do not find their use crossing into other domains of philosophical theorising. There is no compelling reason to endorse an essence-based approach when we can develop a framework with situations. The problem cases for the traditional modal account of existential dependence certainly warrant our attention, however solving them does not require us to abandon a modal account altogether. We have resources that we can employ in a new way that will answer for our intuitions about these modally troubling cases. We can solve them without the added burden of convincingly articulating what essences are and exactly why it is we know that a singleton member will not depend on the set, in accordance with the essence of the member. By making use of situations, we can appeal to theories about the set-member relation in order to substantiate why there is in fact a situation or part of reality that contains only the member's existence and not the set. This way, a situation with only the member will accurately reflect our intuitions about dependence relations where there is a necessary connection between distinct objects like sets and their members.

3.5.1 Why singleton sets depend asymmetrically on their sole members

What makes it so that there is a real partial structure, that is, a situation, in which there is only a member and not a singleton set? What would legitimate the claim that there was in fact a real situation that contained only the member? The content of situations will be determined by our philosophical theories about their constituents, which is well suited to the fact that existential dependence relations ought to be neutral across ontologies and refrain from telling us what depends on what. Contrast this with essential dependence where we need a theory about what essences are to know what the essence of an object will contain and thus what it depends on. Even if an object does not exist, we should be able to identify an abstract situation which has its meaning determined by the appropriate theory about the structure of the entities in that situation.

On the issue of singleton sets and their members that necessarily co-exist, it remains an open question as to whether there really are situations where only the member exists and

yet, there must be a situation with the member and the singleton set for the existence of the singleton. To answer for our intuitions about the set-member relation, Lewis' theory about set membership claims that the part-whole relation should apply not only to individuals but also to sets. We can appeal to the mereological way of making one out of many when it comes to sets. One class is part of another if the first is a subclass of another.[130] Where a class is anything that has members, standardly all sets are classes. Although a set is not a proper class because a proper class is not a member of anything. The main thesis is that parts of a class are all and only its subclasses. This directly applies to one-membered classes such as singletons. A singleton has a sole member and no subclasses except itself making it conceivable as a mereological atom. It has no parts but itself and no proper parts. Anything that is a member of a class has a singleton – every individual has a singleton and so does every set. Only proper classes lack singletons as they are not members of anything. Given Lewis's theses, to be an element of a set or member of class is just to have a singleton that is a part thereof. Members of a class are things whose singletons are parts of that class. Individuals are things that have no singletons as parts. Lewis argues that the relation of a thing to its singleton is what we call membership, yet we do not know where singletons are located. Lewis gets us out of the claim that the member depends on the singleton set but also commits us to the claim that the member isn't needed for the singleton to exist, because the member isn't a part of the singleton any more than the singleton is part of its member. But we need a theory that supports our intuition that in the situation involving the singleton set, the members are the parts of the class that come for free. If it is true that singleton sets depend on their sole member then you can't have a situation with $\{x\}$ and without x.

We might close this gap by making use of Penelope Maddy's mathematical realism in which she claims that sets of physical objects are located in space and time, right where their members are located. This view stems from her naturalistic account of the relationship between numerical beliefs and beliefs about sets which addresses the familiar ontological question of whether numbers simply are sets. Maddy argues there is no need to identify

[130] David Lewis, "Mathematics in Megethology," *Philosophia Mathematica* 1, no. 1 (1993), https://doi.org/10.1093/philmat/1.1.3. 5.

numbers with particular objects - particular sets.[131] In a similar vein, sets of objects are not identified with the matter of their physical members. Maddy writes,

> The set theoretic realist meets this problem by admitting sets of physical objects to the physical world, giving them spatio-temporal location where the physical stuff that makes up their members (and the members of their members, etc.) is located.[132]

We can perceive that there is no situation with $\{x\}$ and without x because of the role of perception in these naturalistic accounts of sets of objects and sets of numbers. Impure sets of numbers or objects are appealing candidates for the subject of perceptual beliefs. Maddy seeks foundational mathematical entities that are directly perceived and the object of set theory – sets – are prime candidates for such entities. If she can show that *some* sets are directly perceived, then she can link these objects of basic perception. Her argument that sets are perceivable relies, in part, on the observation that there is a perceptual difference between seeing an indistinguishable physical aggregate and seeing a set with a determinate number property. For example, there is a perceptual difference between seeing a reddish blob and seeing three apples. In line with her naturalism, she thinks this difference could be explained physicalistically, in neurological terms.[133] This perceivable difference, supports the claim that there is more to a set than the physical stuff that makes up its members. However, Maddy asserts that there is no clear perceptual difference between a single object and its singleton:

> What I want to consider now is the case in which there is only one apple on the table. Is there a perceptual difference between seeing the apple and seeing its singleton? On analogy with the three apple case, the difference should be that the singleton has a determinate number property – one - while the apple does not. Of course it is true that the unindividuated apple stuff has no determinate number property, but as soon as that stuff is seen as an individual object, as a single persisting thing, this ambiguity seems to vanish. A

[131] Penelope Maddy, "Mathematical Realism," *Midwest Studies In Philosophy* 12, no. 1 (1988), https://doi.org/10.1111/j.1475-4975.1988.tb00170.x. 276
[132] Penelope Maddy, "Monism and Beyond," in *Realism in Mathematics* (Oxford, UK: Clarendon Press, 1990). 178
[133] Penelope Maddy, "Physicalistic Platonism," in *Physicalism in Mathematics*, ed. A. D. Irvine (Dordrecht, Netherlands: Kluwer Academic Publishers, 1990). 272.

> perceptual difference between a single object and its singleton is hard to find.[134]

This gives us a good reason for thinking that single members do not depend on their singleton sets since on perceiving the apple there is nothing more in that situation. As soon as we identify the physical stuff as the individual, we do not perceive the set. Maddy claims there is one reality that is inseparably physical and mathematical. The 'over and above' the physical stuff that we perceive upon realising a situation that also has the set in addition to the members, is simply not there. Any situation which includes the set also includes the physical stuff. But not vice versa. If Lewis' singleton operation is something like that non-physical stuff, then he too is offering the same sort of account – the situation in which {Socrates} exists is made of Socrates **and** the singleton-making stuff. Lewis's theory provides a starting point for the standard intuition that existential dependence between singleton sets and their members should be asymmetric. Then with Maddy's set-theoretic realism we can claim that although they are distinct objects, to have the singleton set there must be its sole member. This is what it is to make a singleton and there must be a situation that has the member if it is a situation where the singleton exists. A situation with a single object is complete and does not present in a situation, alongside its set. While the singleton set is not the member, it is tied up with it in a way that it depends on the member for its existence. If this is a true feature of reality, then situations like those that contain both singleton and the member when the former depends on the latter, are situations that are agreeable with Lewis' and Maddy's theories.

Situation theory itself will not be decisive with respect to claims of existential dependence. For example, the bare theory of situations might be neutral with respect to questions around whether any situation containing a given brain state contains a given mental state. To establish whether the mental state existentially depends on the brain state will require us to establish whether situations in which the brain state is present but the mental state is absent, exist. Consider the semantic externalist who will think that the contents of thought are not always solely determined by mental or psychological activity internal to or within the biological boundaries of the agent. Objects that feature in the contents of our

[134] Maddy, "Physicalistic Platonism." 272-273.

thoughts may be part of a situation such that our thought depends on them. The internalist about the mind will deny the externalist claim and assert that in some sense, that anything beyond the body is beyond the mind.[135] For the externalist, if I am thinking about my cat, is it part of the situation in which I am thinking about them? Perhaps my thoughts do depend on this actual cat, yielding an interesting result about the structure of situations from an independent area of philosophical inquiry. That is, how much or how little a situation will include, will be determined by, in this case, the theoretical preferences regarding the content of thought. Importantly, it is our theory choice that affects the dependence relations and so it should.

3.6 Concluding remarks

In this final chapter, I first presented an initial INUS-inspired framework for a modal account of existential dependence by drawing on the INUS proposal for causation by John Mackie. This first attempt, **(D1),** showed to be inadequate for existential dependence which we discovered when addressing a serious problem for both causation and existential dependence. The problem is that on many occasions for both causation and existential dependence we find events and objects that look, non-redundantly, entailed in those conditions needed for the effect or the existence of an object. This issue presents itself in the case of overdetermination, effects with common causes and for necessary existents and necessary co-existents. In light of this worry, I have welcomed the addition of situation theory as central to our new modal framework for existential dependence. A situation is a real partial structure that can substantiate the notion of a minimal sufficient condition that does not contain additional objects that are not relevant to a specified dependence relation. In contrast to possible worlds, a state of affairs containing a dependee will be *situationally* sufficient for a state containing the dependent just in case, in a situation, the former is a subset of the latter.

Minimally sufficient conditions have been identified in terms of the content of all and only those situations in which the dependent object is realised. That content, that is common

[135] Andy Clark and David Chalmers, "The Extended Mind," *Analysis* 58, no. 1 (1998), https://doi.org/10.1111/1467-8284.00096. 7.

across the set of situations with the objects related by existential dependence will be the qualitative description of the object. Every situation in which the dependent is realised also has the dependee. This is how we can spell out the content of partial structures relevant to existential dependence relations. Dependees are INUS conditions in that they are necessary parts of minimal situationally sufficient states for the dependent. The actual possible sufficient condition for *x,* necessarily contains *y.* What is situationally necessary and sufficient for *x* will be all possibly sufficient situations for *x.*

Situations offer a way to form a new modal hyperintensional account of existential dependence and they are desirable in a number of ways. They allow us to solve puzzling cases that arose from the traditional modal existential account, they are a natural continuation of the theoretical posits of possible worlds, they are used successfully in other areas of philosophical inquiry, and they come at a low ontological cost. We can also rely on our theories to determine what objects depend on others since on this account, existential dependence is neutral across ontologies. A situation contains whatever is determined by a theory to be a necessary part of a minimally sufficient situation in which that object is realized. This definition makes it possible to capture existential dependence relations that we think ought to be asymmetric. Here I took the opportunity to explore what theories might support our intuition that situations with singleton sets must also contain their sole members, but that the reverse is not true. Lewis' mereological view of set-member relations gave reasons for thinking that *x* and $\{x\}$ do not depend for their existence on one another at all – but at the cost of giving up the view that situations with singleton sets must also contain their sole members. Maddy's naturalistic mathematical and set theoretic realism on the other hand, did support our intuition with her claim that when we perceive a set which is located in space and time where its members are, there is 'more' available in that situation than the physical make-up of the object. Sole members do not present with anything further than their physical instantiation which is agreeable with the fact that we do not expect to find a singleton set in the situation in which the member exists. If we can determine existential dependence relations on the INUS account in terms of what our theories tell us is realised in certain situations then we have no need for additional primitives that must themselves, be held accountable for their ability to specify how objects are related by existential dependence.

Conclusion

In this thesis, I set out to explore an alternative modal account of existential dependence and in doing so, proposed a framework that employs a neglected theory of causation and treats dependence relations as fixed by patterns of existence across parts of reality, or minimal situations. My aims included conducting a systematic analysis of accounts of existential dependence as they are situated in contemporary metaphysics, and in terms of their key definitional features. This included the subsidiary aim of identifying key reasons for the rejection of these accounts and why they motivate the need for a new modal account of existential dependence. I also sought to identify and isolate important structural features of the relation that must be preserved in moving towards a new account. This led to drawing an analogy between the relations of causation and existential dependence. Lastly, a key aim was to assess and identify how existing metaphysical resources could be used in constructing a new modal account that would be ontologically and ideologically parsimonious.

These aims were achieved in each chapter as follows. In chapter one, I explored some paradigm cases that capture the relation of existential dependence and some thematic trends in the way the relation is instantiated. I then presented the traditional formulation of the modal-existential account and some key problem cases that have led to its widespread rejection. Following naturally from this, I noted the requirement that dependence relations must involve hyperintensional distinctions, and presented Kit Fine's popular essential existential account. Here, I argued that Fine's account is perhaps unnecessarily costly, and we ought to seek a more minimal framework.

In chapter two I drew an analogy with causation to extract the important formal features of existential dependence. Here I argued there is a deep structural parallel between the two relations that should motivate us to look to accounts of causation in forming a new account of existential dependence. While most accounts of causation are too weak in their modal commitments to transfer to an account of existential dependence, there is one overlooked account that does offer the right modal resources. This account is John Mackie's account of causation in terms of INUS conditions. Mackie's claim that causes are necessary parts of minimally sufficient conditions, turns out to provoke many counterexamples and objections to the suitability of his logical framework for causation. However, as we

discovered, these worries do not arise for existential dependence. Mackie's account may be better repurposed as an account of existential, not causal, dependence.

Finally, in chapter 3, I piece together the INUS condition and situation theory for a new account of existential dependence. The definition of the new account was this:

> **(ED$_{INUS}$)** ***x* depends for its existence on *y*** $=_{df}$ necessarily, «*y's* existing» is minimally situationally sufficient for «*x's* existing».

The invocation of situations was central to capturing the hyperintensionality of existential dependence, allowing us to exclude spurious cases of correlation between objects at the level of possible worlds. Such a case may involve objects that exist in exactly the same possible worlds, so that each necessitates the other, and yet our intuitions tell us that only one of them is dependent on the other. Existential dependence claims on this view are more fine-grained than patterns of co-existence among objects across possible worlds. But if we look to parts of possible worlds, to see what objects are accompanied by others in minimal situations in which they exist, we can recover a more fine-grained pattern of existence. Such patterns (in which objects exist in which situations) can be used to define existential dependence in a way broadly akin to the way patterns of existence are used in modal accounts of existential dependence, but the appeal to minimal situations allows us to tease apart even necessarily co-existing objects.

The theory I have proposed is relatively neutral on substantive metaphysical questions concerning which entities, properties, and situations exist. Some of our intuitive verdicts about ontological dependence will rely on potentially contentious theses about what sorts of situations are possible, to be determined by one's theory of choice about specific objects and entities, and what they depend on. For instance, theories about persons that claim persons are physical bodies that depend on their parts will entail that a situation containing a human body (and its parts) will also manage to contain a human person. On the other hand, a theory that claims some non-physical elements of persons are necessary for their existence will have to say that some such situations may not contain a human person, and that more stringent conditions must be placed on a situation if it is to be minimally sufficient for a

person to be realised. A situation is as inclusive as one's theory permits and the theory of situations that has been utilized here remains neutral on what is required for the existence of specific objects. The richer one's ontology, the larger the family of situations and their content available to be combined in a greater number of ways.

There are many possible future directions this work may take, and while I do not have space to explore those here, I will mention some potential extensions and applications of my proposal that might be especially fruitful.

One question we could ask: *what implications might this account have for the metaphysical foundationalist?* This framework might be of interest for those who are curious to pursue challenges to the standard logical features of dependence relations such as, for instance, asymmetry. Elizabeth Barnes has argued there are a range of cases that might be cases of symmetric dependence. (I briefly mentioned these in chapter two.) Perhaps our INUS framework could be applied to these cases in helping make some progress on them. One particular case where Barnes argues for symmetric dependence, is that of mathematical ontology.[136] This is most plausibly a case of symmetric dependence for the non-eliminativist structural realist who believes numbers exist and they are nodes or positions in a structure. Then, each node of the structure depends on the others and perhaps even on the structure itself. The fact that numbers necessarily co-exist is not enough to entail that they are interdependent on each other. The explanatory connections on the other hand, suggest that they might be minimally *s*-sufficient for each other. What it is to be a number is to be a node that is tied up with the other nodes in the structure and their being what they are. Moreover, a number is explained by the relation it stands in to the other nodes in the complex mathematical structure. Explanations might relate easily to our talk of situations since explanations are often representative of sets of propositions about partial aspects of reality, and they tie together information about those parts of the world with a dependence relation. If situations with true propositions about nodes are subsets of situations with true propositions about structure such that the existence of nodes is *s*-sufficient for the existence of the structure, then the structure depends on the nodes. The reverse is also true as there is no situation with true propositions about structure independent of true propositions about

[136] Barnes, "Symmetric Dependence." 59.

nodes. The entire mathematical structure and the nodes are s-necessary and *s*-sufficient for each other. Nodes are s-necessary for structure iff structure is s-sufficient for nodes. Structure is *s*-necessary for nodes iff nodes are s-sufficient for structure. Whenever there is a situation with only the node or only the structure, they will necessarily, be accompanied by the other. According to **(ED$_{INUS}$)**, this may be a case of symmetric existential dependence.[137]

If there are genuine cases of symmetric dependence and this account can accommodate them, then this may challenge the metaphysical foundationalists commitment to the hierarchy thesis. Importantly, situations are far more rigorous in their demands for what it takes to be *s*-necessary and *s*-sufficient, compared to being necessary and sufficient in terms of possible worlds so my theory may make some philosophers inclined to take Barnes' proposal of symmetric dependence more seriously, rather than overlooking such cases as mistaken.

Another interesting future application of **(ED$_{INUS}$)** might be to develop a theory of essence as a continuation of the theory of existential dependence presented here. As things stand, I have proposed a way to rid a modal account of the standard problem cases presented by Fine, without the need for the notion of an essence. The richest conception of essence we are familiar with is that which is presented by Fine who clearly takes there to be an important connection between existential dependence and essence. With his theory of essence in hand, Fine has taken the opportunity to put it to good use in relieving existential dependence of the standard modal problems. I, on the other hand, do not need a theory of essence to come from my theory of existential dependence. I see no use for this notion here; however, that is not to say that the notion of essence is not useful in other places. Fine may be right in thinking that existential dependence and essence are connected so perhaps there could be an account of essence developed from the theory of existential dependence given here. Doing so might involve making use of our broadly modal situations to say that the essential properties of *x* are those common to all possible situations that contain *x.* Then, *P is a situationally essential property of o, just in case o has P in all situations that are sufficient for o.* For instance, every situation which contains some object with parts that has the parts, essentially contains them.

[137] This line of argument for symmetric dependence can, I think, be applied to structuralisms in general. For an example of a related discussion see Johanna Wolff, "Do Objects Depend on Structures?," *The British Journal for the Philosophy of Science* 63, no. 3 (2012), https://doi.org/10.1093/bjps/axr041.

What an object depends on will be that which accompanies only the dependee and its situationally essential properties when realised in minimally sufficient situations.

This suggestion may or may not be attractive. I intend to offer no compelling reason for the reduction of the notion of essence to my account of existential dependence. We do not need to pursue this option and are free to leave things as they are, setting the notion of essence aside as we manage the troublesome cases Fine presented with our account of existential dependence. If the option to develop an account of essence based on our modal theory should be subject to counterexamples and pitfalls, no harm is done to the theory given here. I have shown here that solving the cases that lead to the rejection of the traditional modal account does not require any notion of essence let alone one that must be connected to the theory of existential dependence itself. The notion of a situation equips us with finer-grained, yet still broadly modal resources, allowing us to refurbish a nearly obsolete theory of causal dependence into an attractive account of existential dependence. The virtues of a circular metaphysical economy make it preferable to upcycle existing theories rather than simply discarding them. Developing new resources brings about the trade-off between ontology and ideology that amounts to contraction in one direction, followed by expansion in another. By favouring simplicity broadly interpreted as minimisation in our metaphysical environment, we can repurpose what would have once gone to waste.

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