The Sources of Necessity: Essence, Laws, and Logic

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Sample Chapters

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Introduction:
Necessity and Explanation

1. The Big Picture

This book develops a theory of the sources of necessity, which include essences, laws, and logic. The theory will clarify two concepts that are central in metaphysics, the concepts of necessity and explanation. It is a central tenet of this book that we must account for necessity and explanation together. The book's guiding vision is that necessity is a tool, employed by the sources of necessity to establish explanations; explanations are the product of the exertion of necessity by essences, laws, and logic. To understand necessity, we must determine what sort of "tool" can get this job done. To understand the notion of a source of necessity, we must find the relationship that counts as "employing" the tool. And to understand the full variety of causal and non-causal explanations, we must determine the "manners" in which each source exerts necessity on facts. Above all, we must put those metaphors on solid theoretical footing. If that can be done, sources of necessity hold the key to necessity and explanation, or so I will argue.

Why are the leaves rustling in the wind on this chilly afternoon? The simple answer is that the wind makes them rustle. But this isn't the end of it because we haven't said why the wind makes the leaves rustle. We can answer that question as well. Underlying laws of nature make the wind make the leaves rustle. But once again, we can ask for an explanation: in virtue of what do laws make the wind make the leaves rustle. We could respond that laws of nature "govern the facts", but what does that mean exactly? My proposal will say that laws make the wind make the leaves rustle by exerting necessity, a modal force, on the rustling of the leaves, conditional on the blowing of the wind. It is that particular modal operation which accounts for the leaves' rustling in the wind. However, my story about the governance of laws of nature will be part of a more general story of how explanatory phenomena explain. That story accounts for the "power to explain", which essences and logic, as well as causal and non-casual laws have in common, and it also accounts for differences between them; it aims to capture the distinctive explanatory behaviour of each source of necessity.

Our path to the sources of necessity leads through explanation. In this introductory chapter, we will first acknowledge the existing variety of explanations, and the corresponding variety of those phenomena that give rise to them. We will then ask how those phenomena manage to explain and how they differ in their explanatory behaviour. This will lead us to the modal forces with which they operate, and to the nature of those modal forces as well as to the notion of "exerting" such forces. That's why we need to look at the sources of necessity, why we need to ask what it is to be a source of necessity, and why we need to give an account of necessity itself. This introduction sketches the journey from explanation to necessity and its sources. By the end of it, the reader will know what I aim to accomplish in this book and how I will go about accomplishing it.

2. A World of Explanation

Wittgenstein famously said that the world is everything that is the case, and he went on to clarify that it is the totality of facts, not things. The world is more than a pile of things, or entities. Entities are the material from which the world is built. The world itself, as he suggests,

consists of "configurations" of entities; it is a world of facts. Although I agree with all this, I still find his characterization incomplete. A pile of facts, even one with a rich relational structure, remains static, and our world is not a complex static structure. It is a place where facts come into being, where facts give rise to other facts. There is "production", "generation", "pressure" behind facts. Some forms of that pressure are intrinsic, as when a single fact is held in place or brought about by some underlying force; and some forms are relational, as when some facts generate others. The world isn't static. It's a bubbling, generative place. What is missing from the view that the world is the totality of facts is, in one word, *explanation*.

Taking our naïve, unfiltered experience as a guide, we find many kinds of explanation, different ways in which facts are forced or guided into being. The most familiar one is the force of causation: earlier facts are involved in the causal generation of later facts. Borrowing a popular metaphor from the philosophy of time, the world of facts "grows" along a causal axis. But causality is only one instance of this sort of production. The world also "grows" bottom-up. Facts about more fundamental entities, like the particles of particle physics or the molecules of molecular chemistry, produce facts that are higher up in the layer-cake structure that is our world. Talk of "production" may not apply to all cases of bottom-up explanation. Facts about individual women don't produce facts about the average woman if there are no additional facts about the average woman. But facts about particles or molecules do produce facts about rocks and people, because there really are such facts, just as there really are rocks and people. Facts on the lower strata of reality produce facts on higher levels in something like the way in which earlier facts causally produce later facts. There are these two different axes of generation.

These axes of generation are only part of the "production" aspect of reality, which is missing from the view of the world as a totality of facts. When an object like myself, or anything at all, changes over time, then it is constrained in those changes by its very nature. My own nature would prevent me from changing my state of matter from solid to liquid, say. Or perhaps we should say that if a change of this sort occurred, my very nature would dictate that I cease to exist during the events that constitute this change. Although it is less clear what exactly my own nature is doing here, it is clearly doing something. That I don't change into a liquid is determined by my nature. What I could become is constrained by my nature, and what I actually am is, therefore, in part explained by it. A complete account of the world would not only recognize facts and our two axes of generation, but also those guardrails that explain why certain facts obtain.

What is missing from the view that the world is the totality of facts is explanation. Some facts explain other facts in the generative sense of bringing them into being. And some facts are simply brought into being. Think of the facts that comprise your very nature or think of logical tautologies. There is a certain pressure behind those facts that secures their obtaining, somewhat akin to the causal pressure that secures the obtaining of a causal effect. The world is, therefore, more than just a pile of facts; it is a world of explanation.

Although this description of the world is an improvement, it too is incomplete. Explanations don't come out of nowhere; they are the products of other phenomena that exert an explanatory influence on the facts. In the case of causation, there either are natural laws that govern the facts "from the side line" (think: Pep Guardiola) or there are powers "in the things", which manifest to generate causal effects (think: Duracell bunny). Bottom-up explanations result from essences or from non-causal laws. The very natures of things, their essences, might push the

facts of lower strata upward towards higher-level facts; and non-causal, "metaphysical" laws might govern the development of facts along the axis of fundamentality. Logical explanations, finally, are due to logic itself. Logical consequence somehow sees to it that atomic facts give rise to molecular facts and that logical truths are true. It is logic itself, or logical consequence, which is exerting an influence on the world. From our naïve vantage point, the world is chock-full with explanation, accompanied by those phenomena that introduce explanation into the totality of facts.

Essence, laws, and logic, – they are three of those phenomena that introduce explanation. (I use the plural "laws" to mark that there are causal and non-causal laws.) The image that I will chase and develop in this book describes them as powerful creatures that exert an influence on the facts, each one in its own way. Laws of nature and certain non-causal metaphysical laws generate facts through time and from the bottom up respectively; essences and logic constrain facts in certain ways. They are the active agents of reality, the *explanatory phenomena*, as I will call them. The focus of this book lies on the interaction between these phenomena and the world. If we help ourselves to an agentive metaphor, we can ask how explanatory phenomena "do their job": how do laws make the facts grow, how do essences constrain the world, how does logic do whatever it is that logic does? There are really two distinct questions here. The first one asks for intelligibility, for an account of how that mysterious interaction between explanatory phenomena and world is even possible. And the second one asks for details, for specific accounts of the interactions between each explanatory phenomenon and the world.

One might object to this image on the grounds that I have used deeply metaphorical language to describe it, the language of essences, laws, and logic "interacting" with the world to bring about explanations. It is one of the central ambitions of this book to analyse agentive metaphors with respectable philosophical tools. But even if it is possible to give such analyses, some will object to the productive nature of explanatory phenomena and of explanations in general. The extreme critic will claim that there are no genuine relations of explanation "in the world", and that such relations are mere projections of the human mind. Less extreme critics recognize explanations, but they consider them, in humean fashion, as derivative from the mere constant conjunction of facts. Those critics want nothing to do with what I call explanatory phenomena, phenomena that exert an influence on the world to establish production and generation.

I don't have much more to say in response to those critics than that the quasi-agentive nature of explanatory phenomena, and the productive nature of their explanatory contributions, is a non-negotiable part of the image I aim to capture. I will treat explanation and explanatory phenomena with metaphysical seriousness, and the views that I will develop throughout this book will provoke philosophers with humean inclinations or the metaphysically fainthearted. This is not to say that such philosophers should take no interest in what I have to say. They might want to see what metaphysical curiosities the investigation into my "metaphysically serious" image will deliver; and that might supply them with more grist to their anti-serious mill. I will argue that a feasible account of objective and generative explanation incurs substantial metaphysical costs. Although I will be happy to pay those costs, others might use them as reasons to look for a less costly accounts of explanation elsewhere.

A third critic might object to the unification of the roles that essences, laws, and logic play, according to the image I have painted. My image subsumes the activities of all three under the same genus of exercising an explanatory influence on the world. But one might object that

these phenomena are so wildly different from one another that we should not offer a unified account of their explanatory roles. The question of unification is significant. The main argument for a unified account of the explanatory roles of essence, laws, and logic is that the assumption of unification will prove fruitful throughout the book. I hope that my views will make for a compelling picture partly in virtue of their unifying nature. It is a striking fact that essences, laws, and logic all relate to explanation in similar ways. For, each of these phenomena helps to establish explanations of the form "p explains q", where that explanation could be causal (the rock's impact explains the window's shattering), essential (the tomato's being red explains its being coloured), or logical (the conjuncts together explain the conjunction). And each phenomenon explains why certain truths (the essential, lawful, or logical ones) are true. These similarities have led me to paint a unified image of their power to explain.

3. First Set of Questions: Explanation

My image of the world full of explanations accompanied by explanatory phenomena inspires the first set of questions that I am going to address in this book. The question that marks the beginning of my investigation is the question of how explanation is possible. "Explanation", in my sense, designates an objective phenomenon, something that happens independently of human minds. The rock's impact explains the window's breaking, and facts about atoms explain facts about molecules. The former facts generate or produce the latter facts; they make them come into being. All this is independent from us. When I ask how this sort of objective explanation is possible, I ask how the phenomena that are responsible for them bring them about, or in virtue of what explanatory phenomena explain. Explanatory phenomena have a "power to explain", and I want to know what that power consists in.

The second question is simply this: what are the explanatory phenomena? For this question to be sufficiently substantive, I use "explanatory phenomena" in a demanding sense. Something counts as an explanatory phenomenon in that sense only if, intuitively speaking, it is "really doing the work". Consider a view on which some general truth like "Objects with the same charge repel each other" is a law of nature if and because it is essential to a natural property, here the property of charge. We could then call laws "explanatory phenomena" in a less demanding sense, as they do underly causal explanations. But in my intended sense, only essences would count as explanatory phenomena on that view, since it is the essences of natural properties that ultimately play the explanatory role. I will use this demanding sense when I ask which phenomena are explanatory phenomena, and I will argue that essences, laws, and logic are explanatory phenomena. Much of the book will serve as a defence of this choice. But I also don't exclude the possibility that there are other explanatory phenomena, and I remain open to entirely different selections.

My image assigns a certain unity to the explanatory phenomena. They all exert an explanatory influence on the facts. But there are also important differences between them that concern their explanatory behaviour. From an intuitive vantage point, laws seem to act as input-output mechanisms, which take causes to their effects, or which take facts on more fundamental levels to facts on higher levels. Essences, in contrast, seem to establish certain truths, the essential truths, directly; they seem to do this by constraining the possibilities for things. Your essence, for instance, makes sure that you won't ever change into a polar bear by rendering that impossible for you; your essence explains in this way that you are and remain a human being.

Logic performs several different explanatory tasks: it takes premises to conclusions, explains logical truths, and transfers necessity across logical entailments. Although it is difficult to pin down what exactly it is that logic does, it should be clear that its activities differ from the activities of laws and essences.

This cursory overview hopefully suffices to show that although all explanatory phenomena exert some influence on the world, they differ in how they exert that influence. How then can we characterize and account for these differences in explanatory behaviour? This is the third question. This question branches into more specific questions about individual explanatory phenomena. What does the often cited "governance" of the laws of nature amounts to? What do laws need to do to take causes to their effects? We will see that indeterministic laws pose a particular difficulty here, as their governance does not consist in "enforcing" causal effects. Similar questions arise for essences and logic. We could say that essences explain by constraining possibilities. But that leaves it open how possibility relates to explanation. And the workings of logic seem especially enigmatic because logic is equally involved in several explanatory tasks. Is one of these tasks privileged over the others?

Those are then the three questions that arise for explanatory phenomena: In virtue of what do explanatory phenomena explain? What are the explanatory phenomena? And how does each explanatory phenomenon specifically explain? I now turn to the central assumption that I will use to address these questions.

4. A Modal Approach to Explanation

Our inquiry begins with explanation, as explanation will lead us to necessity and its sources. On the view that I will develop in this book, necessity is a tool. Necessity is a modal force in nature, and explanatory phenomena "use" that force as a tool to affect the world. Explanatory phenomena use necessity qua source: they "exert" necessity on facts. This exertion of necessity has two consequences. One is that explanatory phenomena make certain facts necessary: essences, laws, and logic make essential, lawful, and logical truths necessary. The second consequence is that explanatory phenomena make (non-modal) facts come into being and thereby establish explanations. They do this by exerting necessity on facts. Since I will also use the phrase "source of necessity" for those phenomena that exert necessity, I propose the following slogan: explanatory phenomena explain because they are sources of necessity. This is the modal approach to explanation that I will motivate and develop in this book.[1]

What speaks in favour of the modal approach? The exercise of explanatory influence, the "making the facts grow", "bringing about", "forcing", "guiding", "governing", is an exemplary target for philosophical analysis. This phenomenon practically cries out for analysis, for an illuminating account in terms of less mysterious phenomena. Modality, and specifically necessity, a modal force, fits the bill. Necessity is better understood than the exercise of an explanatory influence, and it is the right sort of phenomenon for the job. It is, moreover, a striking "coincidence" that our candidates for explanatory phenomena are also candidates for sources of necessity. Once we realize that essences, laws, and logic both explain and give rise to necessity, it is tempting to draw an explanatory connection between those two roles. That's

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[1] Several authors have used the expression "source of necessity", including Dummett (1959) and later Hale (2002) in his article "The Source of Necessity".

what my modal approach does: explanatory phenomena explain because they are the phenomena that give rise to necessity.

With the modal approach to explanation in hand, we can put a certain spin on our three initial questions. The first question, "In virtue of what do explanatory phenomena explain?", turns into the question of what makes something a source of necessity in the relevant sense of exerting necessity on facts. The second question, "What are the explanatory phenomena?", turns into the question of which phenomena are sources of necessity. And the third question, "How does each explanatory phenomenon specifically explain?", turns into the question of how these phenomena differ in their respective manners of exerting necessity on facts. Since our answers to any of these questions will depend on our views about necessity and the relationship of source, I will next present my working assumptions about necessity.

5. From Necessity to Source

Mainstream analytic philosophy has seen a rise and fall of modality throughout the 20th century. Influential philosophers like Rudolf Carnap and W. V. O. Quine were sceptical about applications of "necessity" and "possibility" to the world itself. They wanted to contain modal phenomena to semantics and epistemology. Kripke opened pandora's box with his widely influential *Naming and Necessity* (1980), in which he used semantics and epistemology to argue that modality was a worldly phenomenon, which is separate from such categories as the analytic or the a priori. From Kripke onward, the metaphysics of modality was its own thriving discipline, where some argued that modality could be reduced somehow to so-called "possible worlds", while others were prepared to accept modality as a primitive constituent of reality. All the while, metaphysical notions were used everywhere in philosophy. Modal notions like *de re necessity*, *supervenience*, and *counterfactual dependence* were thought to be among the sharpest instruments in the philosopher's toolbox. But then came the fall.

Around the turn of the 21st century, the metaphysical and methodological centrality of modal notions were called into question. There were several traditionally metaphysical notions, which Saul Kripke, David Lewis, and other philosophers of the golden era of modality analysed in modal terms. An *essential property* was considered to be a property that an object has necessarily. The *metaphysical grounding* of one class of facts in terms of another class of facts was taken to be a matter of supervenience. *Ontological dependence* was considered a matter of necessary entailment from the existence of one thing to the existence of another. And various forms of *explanation* were supposedly nothing more than intricate patterns of counterfactual dependence. The golden era of modality ended with the realization that these analyses were dubious at best, and probably just false. If we cannot analyse essence, grounding, dependence, and explanation in modal terms, we must develop accounts of these phenomena without recourse to modal notions. And that is what many authors have done.

Kit Fine is the most prominent figure in this current that ended the modal era. His articles "Essence and Modality" (1994a) and "The Question of Realism" (2001) contain forceful attacks on the view that essence, ground, and dependence can be understood in modal terms. In many other articles, Fine develops positive conception of those traditional metaphysical notions. E. J. Lowe, Gideon Rosen, and Jonathan Schaffer are also important contributors to that project, and so are many others. The lesson that many have drawn from their writings is that modality is neither metaphysically nor methodologically fundamental. Necessity,

possibility, supervenience, and counterfactual dependence are all symptoms of underlying phenomena that run deeper than modality. The world is not at bottom modal, and modal connections are never the ultimate target of philosophical inquiry. Inquiry isn't done when we know the modal facts because those facts underdetermine the essences of things and question about what grounds what.

The rise-and-fall of modality corresponds to an increase in the complexity that philosophers assigned to reality. We now associate Quine with the *extensional paradigm*, which takes predicate logic to capture reality in full. Reality would consist of configurations of objects, properties, and general facts; anything more fine-grained than that belongs to the realm of concepts and modes of presentation, but not to the world itself. The modal era saw a shift to the *intensional paradigm*, according to which we also need modal operators to capture all of reality. The end of that era was powered by a shift towards the *hyperintensional paradigm*. On that view, the world has an even more fine-grained structure: some facts are not determined by extensional and modal facts. Fix all modal facts, and you still haven't settled, for instance, what grounds what, and what holds in virtue of which essences. The phenomena that are more fine-grained than modal phenomena are the *hyperintensional phenomena*.[2]

Arguments for the priority of essence and ground have led to a general suspicion of unexplained modality, at least among those who have embraced the hyperintensional paradigm. Wherever there is necessity, we now suspect an underlying hyperintensional source. If material objects necessarily exist in space and time, if value counterfactually depends on reasons for attitudes, if the mental does in fact supervene on the physical, – most of us would start looking for essences, normative principles, or psychophysical bridge-laws to account for such necessary connections. But although many accept a hyperintensional layer underneath the modal one, there is little agreement on the relationship between the two layers. This has to do with questions about the cartography of hyperintensional phenomena: Which hyperintensional phenomena exactly give rise to necessity? In the language of this book, the question is that of which hyperintensional phenomena are sources of necessity. To answer that question, we must grab headlamp and pickaxe and descend into the rich hyperintensional layer of the world.

Many extant proposals contain views about the sources of necessity. Fine (1994a) and Bob Hale (2002, 2013) argue that essences give rise to necessity. Agustín Rayo (2013) and Fabrice Correia and Alex Skiles (2021) argue that necessity is grounded in generalized identity. Julio De Rizzo (2021) proposes that grounding grounds necessity. And Jessica Leech (2021) suggests a view on which necessity is grounded in logical consequence. Barbara Vetter (2015) has championed a different view, on which potentialities ground possibilities, which in turn ground necessity facts. On her view, sources are really sources of possibility, not of necessity. Options abound. My own view on this question is informed by the modal approach to explanation: sources of necessity are the phenomena that exert an explanatory influence on the world, the explanatory phenomena. Although that leaves us with several options, it does rule out the view that explanation-relations like causation or ground are sources of necessity. If the modal approach is correct, these relations are downstream from the exertion of necessity. I will assume in what follows that essences, laws, and logic are the sources of necessity because they

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[2] The most natural use of "hyperintensional" applies to linguistic contexts C(X), which are such that a substitution of the expressions X for a co-intensional expression Y does not guarantee the preservation of truth-value. The expressions "p holds in virtue of the essence of x" and "p grounds q" generate hyperintensional contexts in that sense. I use "hyperintensional" to characterize phenomena that correspond to such expressions.

are the hyperintensional phenomena that underly both distinctive kinds of necessity and distinctive kinds of explanation. I will say more about this assumption in due course.

This concludes the presentation of the hyperintensional paradigm, which is my main working assumption about modality. The paradigm motivates the need for sources of necessity, and it is an important component of my view that certain phenomena underly both necessity and explanation. If you are not on board with the hyperintensional paradigm, I suggest you read this book as a cautionary tale. The focus on hyperintensional phenomena is still new, and we metaphysicians are currently in the process of determining its consequences. This book is, in part, a study of those consequences. If you disagree with the rich metaphysical conclusions that I will reach throughout the book, this might give you added motivation to maintain your resistance against hyperintensional phenomena.[3]

I will next introduce the second set of questions that I will address in this book. The theme of the first set of questions was explanations; the theme of the second set is necessity. I will then say a bit more about my goals and my methodology, and I will provide brief overviews of each chapter. I will close with practical advice to those who would like to read on.

6. Second Set of Questions: Necessity

The central questions about the sources of modality include the following two: "What are the sources of modality?" and "What is the nature of the relationship of source?" Since I have given my preliminary answer to the first of these questions, I set that question aside. The second one is crucial. The standard view of the relationship of source is that it arises from the definition of necessity. Fine (1994a), for instance, defines that a fact is metaphysically necessary if it obtains in virtue of the essences of all things. Essence is the source of metaphysical necessity, on Fine's view, insofar as essence plays a prominent role in the definition of necessity. One might similarly take natural laws to be the source of natural necessity by featuring in its definition. This definitional view of the relationship of source is also a reductive view because it assumes that necessity is exhaustively defined in terms of its sources. Necessity won't appear in what Ted Sider (2011) calls "the book of the world".

Although the reductive view is popular, it has recently come under attack. There is, first, the enigmatic complaint by Simon Blackburn (1986), which was further elaborated by Hale (2002): necessity can never be fully explained by a source because to fully explain an occurrence of necessity, its source must already be necessary. This is Blackburn's famous "bad residual must", which no reductive ambition, allegedly, will ever get rid of. And there is, secondly, a felt gap that Penelope Mackie (2020) and others have recently pointed out: just as no "is" suffices for an "ought", so no "is" suffices for a "must". If there is an entailment from source-facts to necessity-facts, so the argument goes, then this entailment is substantive and does not follow from a definition of necessity.[4]

I won't discuss the merits of these arguments here. That would take us too deep into the forest of modal metaphysic, which we have barely entered yet. I only emphasize that it isn't obvious

[3] My version of hyperintensionalism will end up with a non-humean take on explanation, primitive necessity, and a revival of a certain form of metaphysical rationalism. If my hyperintensionalist case for these conclusions is compelling, you could modus-tollens your way to a rejection of hyperintensional phenomena.
[4] Leech (2018) and Romero (2019) also advance version of this argument. I discuss the gap in Chapter 3, §3-4.

that the relationship of source is one of definition. There might very well be a different, non-definitional connection between a source and the necessity it gives rise to. I have my own reasons against reductive treatments of necessity, and I will develop my own views on the relationship of source. A correct account of source-hood must explain why sources of necessity feature in the grounds of necessity-facts, and it must also explain why being a source of necessity gives one the power to explain non-modal facts. I suspect that the definitional view of the relationship of source fails at these tasks. For, on the reductive account of necessity, citing a source's exertion of necessity is hardly more than citing the source itself, which won't help to explain how that source manages to establish explanations. I will substantiate this suspicion in later chapters. For now, I only flag that the question about the nature of source-hood is wide-open.

Questions about the sources of modality and the nature of source-hood are directly related to more general questions about modality. My ambition in this book is to develop a theory of the sources of necessity that illuminates modality from within the hyperintensional paradigm. I will next present four questions about the nature of modality that I will attempt to answer in the book. Any truly illuminating theory of modality must answer these questions.

The *Question of Primitivism* asks whether necessity can be reductively defined. It is directly related to the nature of the relationship of source. For, if the relationship of source is the relationship of definition, then we can use sources to fully define necessity; and that would mean to reduce necessity to its sources. But if necessity is not defined in terms of its sources, then it will be difficult to define necessity at all, and a primitivist view about necessity might be the natural consequence. You might expect that the hyperintensional paradigm commits us to the view that necessity can be defined in terms of its sources. For, the hyperintensional phenomena help to ground the necessity-facts. But this isn't quite right. Necessity could be a primitive phenomenon, a "joint in nature", and yet, ordinary necessity-facts could be grounded in facts about the sources of necessity. Whether necessity is primitive or defined depends on the question of whether the relationship of source is a definitional relationship, or whether it is a more substantive connection between phenomena like essence on the one hand and necessity on the other.

The *Question of Pluralism* asks which kinds of necessity there are. The question is not very fruitful in this unrestricted form, as we can easily characterize many kinds of necessity, including logical, metaphysical, natural, technological, and physiological necessity, to just name a few. But we can ask which kinds of necessity are metaphysically privileged in some way. According to Modal Monism, logical or metaphysical necessity is privileged, and other kinds of necessity can be acquired from logical or metaphysical necessity with suitable definitions. Modal Pluralism, in contrast, recognizes multiple equally privileged kinds of necessity. Fine, for instance, claims that metaphysical, natural, and what he calls "normative" necessity are the three most fundamental kinds. There hasn't been much discussion of pluralism since Fine's seminal paper "Varieties of Necessity" (2005a). The question of what privileged kinds of necessity there are remains open.

The Question of Pluralism is closely related to questions about sources. It might seem plausible that each source exerts its own distinctive kind of necessity. Whether this amounts to Modal Pluralism depends on whether different sources relate to necessity in the same way. We could ask, for instance, whether metaphysical necessity relates to essence in the same way in which

natural necessity relates to laws of nature. Modal pluralists would presumably give a positive answer: metaphysical and natural necessity are equally fundamental because they result in the same way from equally fundamental sources. Modal monists would give a negative answer. They could take essences as the source of metaphysical necessity, and they could use metaphysical modality together with the laws of nature to define natural modality. Laws of nature would be a source of natural modality on that view, but that relationship would differ from the relationship between essence and metaphysical necessity. To decide the issue, we must therefore investigate the relationship of source.

The two remaining questions are really problems that arise within our hyperintensional framework. The first one concerns the necessity of source-facts. It is one thing to say that essences are a source of necessity, which make essential truths necessary. It is another thing to explain why essence-facts are necessary. The same issue arises for other candidate sources. That "If p then p" is a logical truth explains that it is necessary. But why is it necessary that "If p then p" is a logical truth? Similarly, "Like charges repel each other" is naturally necessary because it is a law of nature. But why is it naturally necessary that the laws of nature say that like charges repel? We must find out whether a source accounts for its own necessity, or whether we can only explain the necessity of one source by reference to other sources. The first strategy smells of circularity, and it also runs up against Blackburn's point, mentioned earlier, that sources must be necessary before they can give rise to necessity. The second strategy invites a vicious regress, as we need ever more sources to account for the necessity of the remaining ones. This is the *Problem of the Necessity of Source*.

The final question concerns the relationship between different kinds of necessity. A widely held belief within current modal metaphysics is that kinds of necessity are ordered by strength. Metaphysical necessity is often considered stronger than natural necessity, the necessity of causal laws. There is also a more general expectation to the effect that whatever genuine kinds of necessity there are, they constitute an ordering of strength. On the standard interpretation of this ordering, stronger kinds of necessity entail weaker kinds. Every metaphysical necessity is, therefore, also naturally necessary. (The entailment is equivalent to the reverse entailment from weaker to stronger kinds of possibility. Spaces of possibility form concentric spheres around the actual world, the weaker ones are included in the stronger ones.) The *Problem of Relative Strength* is to explain that ordering, or to give an entirely different account of differences in strength. This problem is especially pressing for modal pluralists, who admit several kinds of necessity that are not related by definitions. Understanding the relationship between kinds of necessity will require an understanding of the relationships between the underlying sources.

That leaves us with six questions about necessity. What are the sources of necessity? What is the relationship of source? Is necessity primitive or reductively defined? Are there multiple equally privileged kinds of necessity? What explains the necessity of source-facts? And what explains the ordering of strength among different kinds of necessity? These are the six major question about necessity that the theory of the sources of necessity, which I will develop throughout this book, will attempt to answer. My answers to these questions will be informed by the modal approach to explanation: sources of necessity exert necessity to establish explanations. We will see that most of my arguments for the answers I will give will depend on that guiding assumption.

7. Goals and a Methodological Stance

I have introduced my four major working assumptions. The first one is the assumption that explanation is an objective, generative phenomenon, which does not reduce to mere distributions of categorical facts. Call this *non-reductive realism* about explanation. The second one is the modal approach to explanation, which says that explanatory phenomena explain because they are sources of necessity. This assumption gives necessity a distinctive role in the structure of reality; necessity is a tool used by explanatory phenomena to exert an explanatory influence on facts. The third assumption is the hyperintensional paradigm, which says that there is a layer of hyperintensional phenomena that is more fundamental than modality. The fourth assumption is that essence, laws, and logic are the sources of necessity.

I will not defend non-reductive realism about explanation in this book. Although there are powerful arguments for the view, I know of no arguments whose premises the opponent would accept.[5] I am here simply taking a side. The hyperintensional paradigm is well supported by the recent developments I have cited above. There are several attempts to push back on those arguments,[6] but I will also not engage in those debates here. The explanatory power of my theory of sources might give readers an additional reason to embrace the hyperintensional stance; but this is far from offering a direct argument for it. I will have more to say on the remaining two assumptions. I defend my modal approach to explanation in the early chapters of the book, and I will also defend my selection of sources. The strongest argument for the choice of essence, laws, and logic as sources of necessity is that each of these phenomena makes a distinctive explanatory contribution that is best captured in terms of their manners of exerting necessity. Developing this argument will take the better part of this book.

I will use all four assumptions to develop my answers to the two sets of questions about necessity and explanation. The main questions about necessity ask whether necessity can be reductively defined, whether there are multiple equally fundamental kinds of necessity, why sources are necessary, and why different kinds of necessity differ in strength. The questions about explanatory phenomena concern their distinctive explanatory contributions. These latter questions are less familiar. Metaphysicians have often focused on the nature of essence, laws, and logical consequence. My main target, in contrast, is not the nature of those phenomena, but rather the connection between them and the world, which I call their "explanatory behaviour". We will see that the questions about the explanatory behaviour of sources tie into more familiar debates about the governance of laws, the feasibility of essentialism, and the existence of metaphysical laws.

I will develop my responses to these questions from a certain "robustly realistic" stance about those aspects of reality that concerns necessity and explanation. I assume that necessity and explanation are robustly objective phenomena, which don't depend on human cognition in any

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[5] One argument that will appear in Chapter 4 (§3) says that the famous humean circularity, – regularities help to explain causal effects, which in turn explain the regularities, – renders causation non-generative in a certain sense. And since causation is generative, the humean circularity is problematic. Humeans will most likely reject the premise that causation is generative. Other arguments point out that humeans leave causal regularities unexplained by taking the entire "mosaic of facts" simply as given (Maudlin 2007, Ch. 6), and they point out that some worlds with the same qualitative distribution of facts may differ with respect to laws and dispositions (Tooley 1977, Earman 1986). All these arguments seem good to me, but not to their humean opponents.

[6] See, for instance, Wildman (2013), Bovey (2021) for pushback on essence, and Hofweber (2016, Ch. 13) and Koslicki (2020) for pushback on ground.

way, and which don't reduce to anything like Lewis' humean mosaic of categorical facts. The realist stance includes the assumption that explanatory phenomena explain in generative fashion, which justifies the use of the agentive metaphors of "interacting with the world" and of "bringing about facts". It also includes realist, non-reductive views about the sources of necessity, which are essences, laws, and logical consequence. It might be possible to translate much of my results into less robustly realist frameworks. But since I am writing this from that point of view, it will make following my arguments easier to assume the robustly realist stance.

Finally, I will give much credit to widespread intuitions about modality and explanation. I will assume, for instance, that laws develop facts through time and that essences constrain possibilities. I will rely on such intuitive verdicts as that there are possible worlds with different laws of nature, or that it is absolutely impossible that you are a poached egg. Rather than explaining away such widely shared intuitive verdicts to reduce the complexity of my metaphysical theory, I will happily increase the complexity of my theory if that helps to vindicate those verdicts. I am the sort of philosopher who feels pride, not shame, if they find a complex part of their machinery to be indispensable. It is also part of my robustly realist attitude that these intuitive findings are robustly objective. I will assume, for instance, that differences in modal strength are not merely features of our conceptual scheme, but that they are "out there", independent of our cognition.

It is, of course, difficult to defend such large-scale methodological assumptions, and I won't attempt to do that here. Every philosophical contribution is in part an exercise in a particular practice. This book is not an exercise in empiricist, naturalist, reductionist, or revisionary metaphysics. It is not an attempt to account for apparent parts of reality in terms of broadly cognitive mechanisms, or to turn our rich and complex world into a barren desert landscape. It is rather an exercise in a robustly realist metaphysics of the manifest image, with an eye on the fundamental ingredients that a world must include to produce a reality in that image. To appreciate my conclusions, one will need some patience for, and even find enjoyment in speculative metaphysics.

There is one more assumption that I wish to flag. I have chosen a modal approach to explanation that focuses on the exertion of necessity, and it focuses on those phenomena that are suitable sources of necessity. I have, correspondingly, assumed what Vetter (2021) calls a *necessity-first view*, on which possibility is derived from necessity; necessity is more fundamental than possibility on this view. I find this choice plausible, since the notion of necessity, a modal force, is quite close to the notions of "production", "generation", or "enforcement", which represent the sort of explanation that I aim to capture. An important alternative to my approach would focus on the exertion of possibility and on sources of possibility. One could try to do much of what I aim to do in this book in the possibility-first framework, which takes possibility to be prior to necessity. I don't know of any decisive arguments against the possibility-first approach, and I would be interested to see what its development in light of the issues I discuss in this book would look like. But since necessity is intuitively more closely tied to explanation than possibility, the exertion of necessity is the more natural starting point.

8. Chapter Overviews

The book is in three parts, each containing three chapters. Part I develops the framework for the investigations that I conduct in the other two parts. It develops my account of explanatory

phenomena and of the different manners of exertion, which I use for the analysis of the explanatory behaviour of the sources. It also presents my views about the nature of necessity, which I defend with the modal approach to explanation. Part II investigates the explanatory behaviour of each source individually. It contains my theory of the governance of laws, my views on the explanatory role of essences and logic, and my theory of metaphysical laws. Part III answers questions about modality. It contains my solution to the Problem of the Necessity of Sources and the Problem of Relative Strength. It also includes an account of each source in terms of its "cosmic role", and it integrates all sources into a single explanatory structure that encompasses all of reality.

I will next provide an overview of the chapters one by one, to give the reader a more concrete idea of the narrative arc of the book and of the claims that I will defend. I will then explain in more practical terms how one can work with this book. Readers who are eager to get started with the first chapter can skip ahead to the next section.

Chapter 1 develops my specific modal approach to explanation, the Modal-Axiomatic Account. I first defend the view that we should account for the power to explain in modal terms. But we cannot account for that power in modal terms alone, as there are many phenomena that enter modal relationships, which don't possess the power to explain. Factive phenomena like fundamentality and knowledge are useful examples. They necessitate the facts in their scope (it is necessary that if something is fundamental or known it also obtains), but they are not explanatory phenomena. We must, therefore, find certain special connections to modality that elevate phenomena to explanatory phenomena. This is what the Modal-Axiomatic Account is designed to do. The account says that explanatory phenomena are characterized by *modal axioms*, which are modal principles that are "axiomatic for" the phenomena in question. This account is incomplete without a story about what it means for a modal principle to be "axiomatic for" a phenomenon. I investigate several proposals. My preferred proposal is the Modal-Essentialist Account, which uses essences to interpret "axiomatic for": the distinctive feature of explanatory phenomena is that their constitutive essences contain modal principles. That's what it is for them to exert necessity on facts.

Chapter 2 continues to develop the Modal-Axiomatic Account. It focuses on differences in explanatory behaviour between explanatory phenomena. I argue there that the choice of modal axioms matters, as each modal axiom characterizes a source's manner of exerting necessity on facts. I use different modal axioms to characterize such *manners of exertion*, which correspond to different modal "activities": a source can use necessity to *enforce* facts, it can *confer* necessity on facts, and it can *transfer* necessity across entailments. One central task of the chapter is to defend my selection of five different manners of exertion. The second task is to defend the "uniqueness thesis", which says that each source has just one manner of exertion. In the language of modal axioms, this means that there is one modal axiom for each source. The uniqueness thesis raises the question for each explanatory phenomenon: What is the modal axiom that characterizes its manner of exertion? The third main task of the chapter is to give an overview of my answers to this question. This foreshadows Part II of the book, in which I discuss the manner of exertion of each source in detail. It will become apparent in the chapter that questions about manners of exertion tie into ongoing debates about the governance of laws of nature, the question of whether essence or logic is the ultimate source of absolute necessity, and the existence and nature of metaphysical laws. I will show that my framework of manners of exertion promises to advance those debates.

Chapter 3 discusses the nature of necessity from the viewpoint of the Modal-Axiomatic Account. It develops and defends two views about the nature of necessity. The first one is a version of Modal Primitivism, the view that necessity cannot be defined and is, therefore, a primitive constituent of reality. I will argue that although necessity is primitive, necessity facts are grounded in facts about sources. I call this view Moorean Modal Primitivism in memory of Moore's view about goodness. At the core of my argument is the thought that necessity must be something over and above its sources, if citing the exertion of necessity helps to explain why sources manage to establish explanations. The second view that the chapter defends is a version of Modal Pluralism, the view that there is more than one most fundamental kind of necessity. On my version of the view, Moderate Modal Pluralism, there is a single generic notion of necessity, from which the familiar kinds of necessity, such as metaphysical and natural necessity, are derived as species. Although the view has a monistic element, it considers all familiar kinds of necessity equally fundamental; it does not use one of them to define the others. I will use Moorean Primitivism and Moderate Pluralism to generate the Problem of the Necessity of Sources and the Problem of Relative Strength, which I try to solve in Part III.

Chapter 4 is the beginning of Part II, which investigates the sources individually. The chapter discusses the governance of laws of nature. My starting point is the Armstrong-Dretske-Tooley Account, according to which laws govern by necessitation. Following the arguments from Chapter 1, I translate the necessitation-account into the framework of necessity exertion, and then go on to develop my preferred version of the resulting "enforcement account". The main task of the chapter is to argue against enforcement accounts, and to develop an alternative "conferral account". The central problem for enforcement accounts of governance is that they struggle with the possibility of indeterministic governance because causal explanations are indeterministic precisely when laws and causes do not enforce the effects. I consider three strategies for enforcement theorists to capture indeterministic governance, and I argue against each of them. The conferral account, in contrast, promises to capture both deterministic and indeterministic governance. Its main idea is that laws govern by generating a space of possible outcomes for each causal process. It is those spaces of causal possibilities that lead to the actual continuation in an indeterministic step. The distinctive feature of deterministic laws is that they always reduce the number of possible outcomes down to one.

Chapter 5 discusses essences and logic. Like all three chapters of Part II, it aims to determine the manners of exertion of its protagonist sources. I will argue that the primary explanatory role of essences is to confer necessity to essential truths and that logic's primary role is to transfer necessity across logical entailments. But the main goal of the chapter is to resolve the dispute between two rivalling views about the source of absolute necessity. Modal Essentialism is the currently popular view that essences are the source of the strongest kind of necessity, and that logic merely closes necessity under entailment. Modal Logicism is the opposing view that logic is the source of absolute necessity, and that essences only help to "propagate" the logical necessity of logical truths. The slogan associated with Logicism is that for a truth to be absolutely necessary, it must be translatable into a logical truth with real definitions. Although Modal Logicism had been overlooked for a while, recent work by Augustin Rayo, Fabrice Correia, and Alex Skiles on the relationship between essence and numerical identity provide a framework for Modal Logicism. With their work, we can support the claim that every essential truth is a "logical truth in disguise". It is a small step from here to Modal Logicism. I spend much of the chapter on developing and motivating Logicism, as I take it to be a formidable

opponent for essentialists. However, I do side with Essentialism and develop a principled argument against Logicism. The main thrust of my complaint is that logicists cannot capture genuine *de re* necessity.

Chapter 6 discusses laws of metaphysics, which have recently received some attention by Rosen, Schaffer, and others including myself. Most of what has been written about metaphysical laws leaves two central questions open. The first one is the question regarding their content: what do metaphysical laws say, or what are they about? The second question is whether metaphysical laws are reducible to essences, as Boris Kment argues, or to natural laws, as Ross Cameron has suggested. Our response to the second question will decide whether metaphysical laws are a distinctive source of necessity. The main goal of the chapter is to argue that metaphysical laws are not reducible to essences or to laws of nature, and that they, therefore, are a distinctive source. I will develop two arguments for that view, one claiming that metaphysical laws have a distinctive manner of exertion, and one claiming that they exert a distinctive kind of necessity. A subsidiary goal is to provide an answer to the first question as well. I present and defend my Constructional Conception of Metaphysical Laws, on which metaphysical laws characterize construction operations, like composition, which sort the ontology into basic and derivative entities.

Chapter 7 kicks off Part III, whose main goal is to solve the Problem of the Necessity of Sources and the Problem of Relative Strength. This chapter deals with the first of those two. It begins with an explanation of why all source-facts are necessary: essence-facts and logic-facts are absolutely necessary, natural law-facts are naturally necessary, and metaphysical law-facts have their own distinctive metaphysical necessity. I then argue against existing accounts of the necessity of sources by Hale, Fine, and others. The main problem for those accounts is that sources must be necessary before they can help to ground further necessity-facts. The upshot is that source-facts must have a sort of necessity that applies to them "automatically", without the help of a source. The main goal of the chapter is to develop an account of that automatic necessity. The central ingredient of that account is the Anchored Conception of Possibility, which defines each kind of possibility, – absolute, metaphysical, and natural possibility, – relative to the facts that obtain prior to the associated necessity-facts. This conception of possibility assigns an automatic sense of necessity to every fact that helps to ground necessity, which means that source-facts will also receive this sort of necessity.

Chapter 8 addresses the Problem of Relative Strength. I distinguish several kinds of necessity throughout the book, including absolute, metaphysical, and natural necessity, and I claim that they are ordered by strength. One task of the chapter is to settle the nature of modal strength differences. I look at three different conceptions of modal strength, – the intrinsic conception, the counterfactual conception, and the entailment conception, – and I argue for the orthodox entailment conception, on which stronger kinds of necessity entail weaker ones. But the entailment conception generates the Problem of Relative Strength. For, on my brand of Pluralism from Chapter 3, entailments between kinds of necessity require entailments between underlying sources. "Being an essential truth", however, does not entail "being a law of nature". Since these entailments seem implausible, it seems as though pluralists cannot afford differences in relative modal strength. My solution accounts for differences in modal strength with different positions within a single network of metaphysical priority relations, which includes all sources. The idea is this: metaphysical necessity is stronger than natural necessity because the former is metaphysically prior to the latter. My development of this view relies on

two substantive principles that I will defend. One is the Anchored Conception of Possibility from Chapter 7. The second one is the Priority of Possibility, which says that for any contingent fact, the possibility of the fact is metaphysically prior to that fact itself.

Chapter 9 is the grand finale of the book. It ties together various themes and pushes the investigation further into new directions. The main goal of the chapter, its call to action, is to account for the Priority of Possibility principle from Chapter 8, or something close enough. The gist of that principle is that for certain facts, their possibility is explanatorily prior to the facts themselves. My aim is to derive Priority of Possibility from the account of explanatory phenomena that I have developed in Part I. The chapter also has two subsidiary goals. One of them is to outline an indeterministic version of Metaphysical Rationalism and of an associated principle of sufficient reason that combines naturally with the views developed in the book. The second goal is to define each source of necessity in terms of its "cosmic role", which is the role it plays in the explanation of contingent facts. At the heart of the chapter is the Doctrine of Productive Possibility, which says that anchored spaces of possibility actualize in an indeterministic and explanatory step; they give rise to actuality. With the doctrine in hand, we can construe reality as a "cosmogenic sequence"; which runs from essences and logic, via the absolute, metaphysical, and natural possibilities all the way to the contingent facts.

9. Practical Advice

Each chapter can be read in relative isolation from other chapters. I provide summaries of the ideas from previous chapters wherever necessary. Some of the summaries are quite brief, so as not to unduly increase the length of this book. The reader will, therefore, always be pointed to the relevant sections in earlier chapters in case the need for a more detailed look arises. That said, the three parts and nine chapters are interconnected: Part II makes plenty of use of the chapters of Part I, and Part III uses ideas from all chapters in Parts I and II.

Readers could pursue the two major strands of the book, viz. necessity and explanation, separately. I develop my material on explanation and explanatory phenomena especially in Chapter 2 and in Part II. The chapters of Part II, which discuss the sources of necessity one by one, are relatively independent from one another. One could read any one of those chapters without the other two. If you are only interested in my treatment of laws of nature, in my discussion of Modal Logicism, or in my treatment of metaphysical laws, you could go straight to the relevant chapter. For my defence of certain underlying assumptions that I use in those chapters, and for a more detailed exposition of my necessity-exertion framework, you will then have to go back to Chapters 1 and 2.

I develop the material on necessity especially in Chapter 3 and in Part III. The chapters of Part III are more tightly connected than the ones in Part II. I recommend reading the chapters of Part III in the order in which they appear in the book. If you are interested in my solution to the Problem of the Necessity of Sources or to the Problem of Relative strength, you can go straight to the relevant chapter. But to appreciate the full defence of the most central assumptions of Part III, I recommend that your read all three chapters. More generally speaking, while Chapter 1 is an important ingredient in both strands concerning explanation and necessity, you could jump from Chapter 2 to Part II, or from Chapter 3 to Part III.

A final point I wish to emphasize is that this book aims to provide a framework for modal metaphysics. I intend many of my specific claims first and foremost as support for the fruitfulness of the framework. My ideas on the nature of source-hood, on the explanatory role of necessity, on the unification of explanatory phenomena, on the problems regarding the necessity of sources and relative strength, and on metaphysical cosmogony, – they are all part of the framework. What is not part of the framework are my specific claims about which sources of necessity exist, how they each rank on the order of strength, and how exactly they operate. I have developed my preferred views on those questions, and I have defended them to the best of my ability. But if you convinced me of opposing views on those issues, within the framework that I develop in this book, I would consider that a success.

Part I
The Framework

Chapter 1:
Explanatory Phenomena

1. Introduction

This book is a study of necessity and its sources, the phenomena that give rise to necessity-facts. And yet, the main focus of the first two chapters is not on necessity or on any of the sources of necessity in particular, but on explanation, a specific objective sort of explanation. The investigation of explanation will lead us to the sources of necessity and to deep and puzzling questions about sources and about necessity itself. My views on necessity, which I will defend throughout the book, assign a certain "cosmic role" to necessity and its sources. The reason that there is necessity in the first place is that certain phenomena, the *explanatory phenomena*, establish explanations *by* exerting necessity on facts. Necessity is a tool and explanations are the goal. This, at any rate, is the vision that I will defend directly in the first two chapters, and indirectly in all the chapters to come.

I will say much more about explanatory phenomena throughout this chapter. But it will be useful to see right away which explanatory phenomena I envision. The essences of all things, the laws of nature, so-called laws of metaphysics, and logical consequence relations: these are the four explanatory phenomena that I defend and investigate in this book. I will argue below that these four phenomena give rise to distinct kinds of explanation, and that each of them establishes explanations by virtue of exerting necessity on facts. While laws of nature establish familiar causal explanations, the other three explanatory phenomena establish non-causal, or "metaphysical" explanations. Although I investigate this roster of explanatory phenomena below and in the subsequent chapters, the account of explanatory phenomena that I will develop in this chapter is independent from that particular selection.

A comment on the expression "phenomenon" is in order before we begin. I will use "entity" to apply to everything in the ontology, including objects, properties, facts, events, and whatever else there might be. I use "phenomenon" in a more encompassing way, to include both entities and *mere ideology*. Putative examples of mere ideology include "necessity", "not", "for all", "essence", "law", "logical consequence", "will" and "was", "exists", and the "is" of predication, among others. If these expressions are mere ideology, they have no ontological correlates. We can use them in a perfectly meaningful way, even if they don't correspond to anything in the ontology. But if "necessity", "essence", "laws", and "consequence" have no ontological correlates, it is still convenient to speak as though there were such entities. I will, in this vein, refer to necessity and the explanatory phenomena as "phenomena" to remain neutral on whether they correspond to anything in the ontology.

With all this in mind, let me outline this chapter. I will begin, in section 2, by characterizing the specific notion of explanation that will lead us to explanatory phenomena. In section 3, I will introduce the four explanatory phenomena, and I will explain what one's choice of explanatory phenomena should depend on. I will there raise the main question of the chapter: In virtue of what do explanatory phenomena have their "power to explain"? In section 4, I argue that, despite initial appearances, this question requires a substantive response. I develop my own account of explanatory phenomena, the Modal-Axiomatic Account, in section 5, and I develop my preferred version of that account in section 6. I address objections and add clarifications in section 7. Section 8 concludes with a preview of the next steps.

2. Generative Explanations

The explanations I have in mind are *objective*, *generative*, and *general*. They are objective in the sense that they do not depend on thinkers that could grasp, convey, or understand them. They simply obtain "in the world", independently of "us". They are generative in the sense that the explained fact is "entirely new"; it entered reality upon its explanation, and it didn't exist prior to its own explanation in any way. They are general in the sense that there is a single genus, explanation, of which there are multiple species. Causal explanation is one such species, and there are also multiple non-causal species. When I speak of explanation in what follows, I mean objective, generative, and general explanations. I will first clarify those three attributes further, before I turn towards the issue of accounting for these sorts of explanations.

We can distinguish the speech act or social practice of explanation from those explanations "out there" that we can discover (Lewis 1986c). Your explaining the breaking of the window in terms of the rock's impact is distinct from the objective causal explanation that relates facts about the rock to facts about the window. We can also distinguish a neurologist's act of explaining an experience of pain in terms of certain neuronal events from the objective constitutive explanation that relates neuron-facts to pain-facts. Some have argued that there is only a single notion of explanation, and that the difference between the window-breaking and the pain-experience pertains to underlying relations of "making". On their view, the rock makes the window break in a causal fashion, and the neuronal activity makes the pain occur in a non-causal constitutive fashion. Both kinds of making give rise to a univocal notion of explanation. But this is not how I will use the term "explanation". I will say that the rock-impact explains the window-shattering causally, and the neuronal activity explains the pain experience constitutively. I will speak of different kinds of explanation, and I will not distinguish those kinds of explanation from underlying relationships of making. The objective explanations I have in mind just are these occurrences of making. Different kinds of making are different kinds of explanation. That is how I will use the notion of objective explanation.

Ordinary language offers many metaphors for generative explanations. We can say that something "leads to", "produces", "gives rise to", or "begets" something else, or that it "makes it the case" or "brings it about". These metaphors all express the "coming to be" of a fact: the explained fact is not part of reality at first, but it becomes part of reality upon its generative explanation. Generative explanations are metaphysically demanding; they involve Hume's elusive "necessary connexion", a genuine connection running from explainer to the explained. Hume, of course, rejected generative explanations based on his empiricist theory of cognition. He had no use for them because he couldn't characterize them in the language of sensory impressions. But the force of such empiricist scruples has faded over the centuries, and many now agree with Kit Fine's dictum that "it is better to throw conceptual caution to the winds and adopt whatever models or metaphors might help us understand how the concepts [of metaphysics] are to be employed." (Fine 2001: 14) I too am ready to throw conceptual caution to the winds, and I take our metaphorical understanding of generative explanation to suffice for fruitful philosophical theorizing. I will make free use of this notion here and will put it on more solid theoretical footing towards the end of the chapter.

It is controversial whether any given kind of explanation is generative. According to so-called humeans about causation, for instance, causal explanations are not generative. On their view, causal laws derive from the "humean mosaic", the distribution of non-modal properties across

space and time. One fact, *f*, explains another fact, *g*, if the succession of facts of the *g*-type upon facts of the *f*-type fit a larger pattern. By subsuming an occurrence of facts under larger patterns, we systematize the facts, which allows us to make sense of that occurrence, to understand why those facts occurred, and to predict similar patterns in the future. Humean explanations are *systematizing* and not generative because the explained fact was "already there", as part of the humean mosaic, prior to its own causal explanation. Systematizing explanations of the humean variety don't rely on any mysterious notions of making or generating; all they require is a notion of "fit" or "subsumption" relating singular occurrences to general patterns.

The humean conception of explanation could also be applied to non-causal kinds of explanation, such as grounding explanation of macro-phenomena in terms of micro-phenomena, or logical and mathematical explanations. If a thoroughly humean view of the world were correct, all explanations would be systematizing. But I mention systematizing explanation mostly to set them aside. I will assume a non-humean view on causation, as I take causal explanations to be generative; and I also take several kinds of non-causal explanation to be generative, or to have certain generative aspect, about which I will say more below. But I do think that those with humean inclinations may also benefit from my account of generative explanation; it is, after all, good to know your opponent.

Now that we understand what it is for an explanation to be objective and generative, let me say more about the generality of explanation. Explanation in the intended sense is a genus that admits of several species. One of those species is causal explanation, and there are also non-causal explanations. Non-causal explanations have received a lot of attention recently, often under the heading of "grounding", "metaphysical explanation", and "the in virtue of". The rediscovery of non-causal kinds of explanation has led to a reframing of many disputes that we used to frame with modal notions like *necessitation* and *supervenience*. Instead of asking whether laws of nature supervene on the humean mosaic, we now ask whether the humean mosaic grounds the laws. We similarly ask whether the microscopic world grounds the world of ordinary things, whether prescriptive facts obtain in virtue of descriptive facts, whether mental states occur in virtue of neurological states, etc. All those instances of ground are non-causal ways of making-it-so; they are generative metaphysical explanations.

If causal and non-causal explanations form a genuine dichotomy, then explanation is a genus with two species. But there is a striking variety among non-causal explanations, which suggests that they include several distinctive kinds. Some non-causal explanations are mereological in character: the properties of the parts metaphysically explain the properties of the whole. Others are mathematical: there is an infinity of natural numbers because of the Peano Axioms. Others are logical: a disjunction is true because of its true disjuncts, and existential generalizations owe their truth to their instances. Granted, the mere fact that there are several kinds of metaphysical explanation, including mereological, mathematical, and logical ones, among many others, does not yet conflict with the dichotomy view. There are also causal explanations that pertain to different domains, but there is only a single causal kind of explanation. But the variety among non-causal explanations suggests at least the possibility that there are distinct kinds of non-causal explanations, and we will see below that this possibility is very likely.

Objective generative explanations are independent from human minds and contrast with systematizing explanations that result from the subsumption of facts under general patterns.

There are several kinds of objective, generative explanation, including causal explanation and potentially multiple kinds of non-causal explanations. Generative explanations, thus, give rise to two metaphysical tasks, one concerning the individuation of kinds of explanation, and one concerning the nature of explanation. The first task is to supply a differentiating feature that allows us to individuate and define distinct kinds of explanation. The second task is to provide an illuminating account of what generative explanations are. This second task is especially urgent, as generative explanations have an air of mystery around them. They are like no other relation between facts. Chains of generative explanations form "unfolding" explanatory sequences of which we have a mostly metaphorical understanding. It is striking that we have so many different metaphorical expressions for generative explanation, but none that is entirely clear. That together with the fact that explanation is so ubiquitous makes generative explanation a perfect candidate for philosophical analysis; it almost "cries out" for an account. On this I agree with Hume. I suggest that to understand generative explanations, we should study the phenomena from which they arise. That is what I turn to next.

3. Explanatory Phenomena

Explanations are the products of underlying *explanatory phenomena*. Causal explanations result from natural laws or from causal powers. Logical explanations result from logical consequence relationships. Grounding explanations result from essences or from metaphysical laws. The rock-impact causes the window to shatter because of the laws that govern the kinetic properties of objects in space and time. The true disjunct explains the disjunction because of the logical relationship between them. The activities of academics in conference venues explains the occurrence of a conference because of what conferences are, which is to say that this grounding explanation derives from the essence of conferences. And the existence of some objects explains the existence of their sets because of the metaphysical laws of set theory. We can find putative explanatory phenomena for every explanation.

There are also principled reasons to expect the existence of such phenomena. The primary one is that explanations are derivative phenomena. No fact explains another fact *just so*. There is always a "metaphysical mechanism" by which the fact that does the explaining yields the explained fact. Explanations are, metaphysically speaking, not the end of the story. This fact is evidenced by the general patterns that we can observe among explanations. Hume has taught us that causation involves constant conjunction: if this rock causes this window to shatter, then that rock causes that window to shatter. And what goes for causal explanations, also goes for non-causal explanations: similar configurations of smaller objects ground similar configurations of more complex ones, facts about similar faces ground facts about similar smiles, and so on. It is the general shape of the underlying explanatory phenomena that explains the general patterns among explanations.[7]

We can use explanatory phenomena to individuate kinds of explanation. How many kinds of generative explanation we count depends on our scheme of classification, which is merely a psychological fact about us. But there is an objective taxonomy for explanations, one that

[7] Dasgupta (2014) and Rosen (2017: 284-5) explain why views of non-causal explanations without explanatory phenomena, such as Bennett (2011a) and deRosset (2013), cannot account for general patterns. Schaffer (2017) provides additional arguments for a "link" between explanans and explanandum. This link is the explanatory phenomenon.

employs their correct principle of individuation. We should individuate kinds of explanation by their characteristic grounds, which are the explanatory phenomena responsible for the explanations in question. Causal explanations are the clearest case. Physical, biological, or chemical explanations are species of the common kind 'causal explanation'. They all belong to the same kind because they depend on causal laws. Causal laws are the explanatory phenomena responsible for causal explanations, as they establish causal explanations. What goes for causal explanations goes for kinds of explanation in general; we should individuate kinds of explanation by their associated explanatory phenomena.

To see this proposal at work, consider a psychophysical explanation of an experience of pain in terms of some neuronal event. If the underlying phenomenon is a causal law, then the explanation is causal. If the explanation results from the essence of pain, then it is non-causal. And if the explanation results from some sort of non-causal, "metaphysical" law, then the explanation is also non-causal, but it is a different sort of explanation than the one that would result from the essence of pain. There might be more "distance" between the explanans and the explanandum, as in the case of emergence, if the underlying phenomenon is a metaphysical law. (A detailed look at metaphysical laws will have to wait until Chapter 6.) What the example illustrates is that it is natural to define kinds of explanations in terms of the underlying explanatory phenomena.

We must therefore determine the explanatory phenomena to determine the kinds of explanation. What are plausible candidates? Essences might be the safest candidate. Many explanations arise from essences. The essence of conferences underlies explanations of conferences in terms of the activities of participating individuals. The essence of being a husband underlies explanations of husband-facts in terms of facts about gender and marital status. We could easily multiply examples. Moreover, there is no reduction of essences to any other explanatory phenomena in sight. It is therefore not an option to say that essences only look like explanatory phenomena, but that there really is some underlying phenomenon that is responsible for essence-based explanations. I thus consider essences a solid candidate for being an explanatory phenomenon.

A second plausible candidate are the laws of nature, which produce causal explanations. But even if there are generative causal explanations, this choice is not obvious. The relevant explanatory phenomenon could also be a different member of the causal family. The view of laws of nature that govern the facts is "Platonic" in form, as laws reside outside of the objects of space and time. (David Armstrong (1983) has tried to deny this. But even Armstrong's laws are at some distance from the objects in space and time.) On the "Aristotelian" alternative, causal explanations result from the exercise of causal powers within objects. Proponents of both views may accept the existence of laws and powers; their disagreement is on which of the two is the active ingredient, the explanatory phenomenon.

One might think that essences plus one additional causal phenomenon (laws or powers, most likely) exhaust the explanatory phenomena. This would amount to the dichotomy-view, on which there is one kind of causal explanation, and one kind of non-causal explanation. But we have already seen that the variety of non-causal explanations suggests that there could be several distinct explanatory phenomena. Two phenomena strike me as especially plausible candidates. The first one is logic. While logical explanations often have a bewildering effect on the uninitiated, they play a prominent role in the literature on non-causal explanations. Grass

is green or cats bark because grass is green. There are dogs because Fido is a dog. All dogs bark because Alma, Boris, Christine, etc. are all the dogs, and each of them barks. These explanations are distinctive, they are logical explanations that arise from logical consequence relationships. This is not to say that every logical entailment corresponds to an explanation; it merely says that some logical relationships among facts or propositions establish explanations in some way. It is an open question how logic does this, just as it is an open question how laws or essences establish explanations. What seems clear, however, is that logic gets this done. Logic is, therefore, another candidate explanatory phenomenon.

It might seem odd to think of logical consequence as an explanatory phenomenon. For, it is quite common to think of logical consequence as a relation between sentences. Sentence s1 logically entails sentence s2 just in case every interpretation of the non-logical expressions in s1 and s2 that makes s1 true also makes s2 true. And sentence s1 is logically true just in case it is true under every interpretation of its non-logical constituents. John Etchemendy (1990) has shown that such semantic notions of consequence are not explanatory. This is easy to see for the notion of logical truth. "Peter exists or he doesn't" is a logical truth because all interpretations of this sentence, including the ordinary one, are true. Hence, on the semantic conception of consequence, truth explains logical truth, and not *vice versa*. Regardless, the notion of logical consequence that I have in mind is not linguistic. When I say that p is a logical truth or that p logically entails that p or q, then I use "logical truth" and "logical entailment" as sentential operators, not as predicates that express properties of sentences. That it is raining or not raining is a logical truth, independently of its linguistic expression. Linguistic notions of logical consequence, especially those that we define with respect to formal languages, are tools to investigate the non-linguistic phenomenon.[8] The non-linguistic notion of logical consequence is a plausible candidate explanatory phenomenon.[9]

I will use the label "metaphysical laws" for the fourth putative explanatory phenomenon. This rubric might contain mereological laws, set theoretical laws, arithmetical laws, psycho-physical "emergence laws", normative laws, and whichever principles might make a distinctive explanatory contribution. Metaphysical laws might form one unified explanatory phenomenon, or there might be several different explanatory phenomena. I myself will argue for one specific conception of metaphysical laws in Chapter 6, on which metaphysical laws produce explanations that cross "ontological layers". On this sort of view, laws of mereology and set theory are examples of metaphysical laws. Specific types of non-causal laws, such as mathematical or psychophysical laws, could then be construed as essences, laws of nature, or as metaphysical laws in my sense, depending on substantive views on mathematics and the mind. But my particular view on metaphysical laws does not concern us here. I am merely presenting options.

The putative explanatory phenomena, thus, include essences, laws of nature or powers, logical consequence, and metaphysical laws (either as a single explanatory phenomenon or as several phenomena). Explanatory phenomena correspond to distinct kinds of explanation. As I use "explanatory phenomena", it is a substantive question which of the candidates really are

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[8] I agree with Sider (2010: Ch.1; 2011, Ch. 10), who points out that it is a common mistake to think that formal logic gives us an account of the nature of logical consequence.

[9] Henrik Rydéhn has suggested to me that the popular slogan "the conclusion is already contained in the premises" conflicts with the claim that logical explanations are generative. Although I agree with this point, logic might still provide generative explanations of logical truths.

explanatory phenomena, even if we grant their "existence".[10] We have seen that in the case of causal phenomena, we must choose between laws of nature and powers. The one we do not choose still exists and yet fails to be an explanatory phenomenon.[11] More generally, if one of the candidate phenomena reduces to another, then the first one is not an explanatory phenomenon in the intended sense. To see this, consider a reduction of natural laws to essences. Some have argued that natural laws are essential truths about natural properties. Schematically, "All Fs are G" is a law of nature on this view just in case it is essential to the properties F and G that all Fs are G.[12] This view reduces laws to essences. If this reduction was correct, it would be highly misleading to call laws of nature "explanatory phenomena". For, it is the essence of natural properties that is fully responsible for causal explanation. Laws as such don't play any significant explanatory role on that view.

Similar reductions of logic and metaphysical laws have also been defended. On the reductive view of logical consequence, logical truth reduces to the essences of logical constants: to be a logical truth just is to be essential to entities corresponding to logical constants.[13] If an account along these lines is correct, then logical consequence is not a genuine explanatory phenomenon because the essences of logical constants play the relevant explanatory role; it's essence, not some other phenomenon, that explains logical truths and establishes logical explanations. Boris Kment (2014: Ch. 5) has proposed a similar reduction of metaphysical laws to essences. He claims that metaphysical laws are certain conditional claims that are essential to those phenomena whose explanation they underly. We can formulate the general upshot of these examples as follows: a phenomenon is an explanatory phenomenon only if it does not reduce to another explanatory phenomenon.

There is no all-purpose recipe to determine which of these reductive strategies is successful. On one extreme end of the spectrum, we would reduce all explanatory phenomena to essences alone. Laws of nature would come from the essences of perfectly natural properties, logical relationships come from the essences of logical constants, and metaphysical laws come from the essences of all kinds of derivative phenomena. On the other end of the spectrum, there are four distinct explanatory phenomena: essences, laws of nature, laws of metaphysics, and logical consequence (and more, if metaphysical laws comprise several distinct explanatory phenomena). Several in-between views are possible. My own view is that there are four distinct explanatory phenomena. I will make my case for this choice throughout this book. I will argue that each of the four phenomena plays a distinctive explanatory role and thus has explanatory life of its own. (I will showcase my arguments towards the end of Chapter 2.) The rest of the current chapter, however, does not rely on my particular choice of explanatory phenomena.

Whichever roster of explanatory phenomena you choose, you will face the following question: *What do explanatory phenomena have in common that accounts for their power to establish generative explanations?* In other words, what constitutes their "power to explain"? Explanatory phenomena, like essences, laws, and logic, "reach into the world", "influence the

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[10] Recall that phenomena need not literally exist, as they may not be part of the ontology. But they do exist in the sense that they feature in truths.

[11] Alexander Bird (2007), for instance, claims that natural laws as grounded in dispositions, which establish causal explanations.

[12] Bigelow, Pargetter, and Lierse (1992) defend a view along those lines.

[13] Fine (1994b) and Hale (2013) develop this idea in different ways. Hale thinks of logical entities as functions, Fine thinks of them as concepts. See Keefe and Leech (2018) and Leech (2022) for criticism.

facts", make-it-so; they have a power to explain. The goal of this chapter is to develop an analysis of that power. My account of the power to explain will serve as the basis for an entire book, eight more chapters in total. So, before I develop my answer, I better make sure that the question is a good one to ask. I next turn to potential reasons for why this may not be so. Unsurprisingly, I will argue that we do in fact need a unified and informative account of the power to explain.

4. Triviality Objection

Explanatory phenomena may include essences, laws of nature, laws of metaphysics, and logical consequence. Whichever explanatory phenomena there are, we must account for their peculiar power to establish generative explanations. They must have something in common that makes it intelligible to us how they interact with the world, or so I claim. One could try to resist this need for an account of their "power to explain" in several different ways. I will consider three objections before I develop my account. The first objection points to existing theories of scientific explanation. If these theories offer promising accounts of explanation, our question may have already been answered. The second objection rejects the assumption that there is a unified account of the power to explain. The third "triviality objection" contends that we don't need to give a substantive account of the power to explain, as once we have posited suitable explanatory phenomena, we get explanations for free.

We can frame the first objection as a request for clarification: don't we have very elaborate theories that specify the meaning of sentences such as "The window broke because it was hit"? Yes, we do! But to account for the power to explain is different from accounting for the truth of explanatory claims in science and everyday life. There is a rich and important literature on the nature of such ordinary explanations and on the semantics of the sentences we use to convey them. Interventionist causal modelling accounts are especially promising for the semantics of various kinds of explanation claims.[14] They account for explanations in terms of well delineated counterfactual relationships among facts. But these accounts simply presuppose the relevant counterfactual connections. They don't explain how the explanatory behaviour of sources leads to those connections, and they have nothing on offer that would cash out our generative metaphors of explanatory phenomena "reaching into the world" to "make facts come into being." Interventionist theories have, after all, been defended by staunch humeans. They are best understood as applying on a highly derivative level, while being indifferent about the underlying metaphysics. Since similar remarks apply to other familiar accounts of scientific explanation, we must look elsewhere for an account of the objective generative sort of explanation that we are after.

The second objection targets the classification of essences, laws, and logic under a single label of "explanatory phenomena". Existing theories of explanation tend to target specific explanatory phenomena, and although there are striking structural similarities among explanations of distinct kinds, one could doubt that their respective underlying metaphysics is the same. My *presumption of unity* says that there is a unified account of the behaviour of explanatory phenomena. This does not imply that every explanatory phenomenon interacts with the facts in the same way (see Chapter 2), but it does say that there is a common core to

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[14] See Woodward (2003) for the *locus classicus* and see Schaffer (2016b) and Wilson (2018) for an extension to non-causal explanations.

these interactions. It is this common core that I will investigate in what follows. The second objection contends that the presumption of unity might be false. It is conceivable that generative explanation is a disjunctive kind with diverse realizations. But even if this is correct, I still maintain the presumption of unity as a working hypothesis. If essence, laws, and logic establish explanations, then it would be attractive to integrate their activities in a single unified framework. This book is an attempt to show that such a unified framework has considerable explanatory power.

Even if you grant the presumption of unity, however, you might think that the step from explanatory phenomena to explanation is metaphysically trivial. According to that objection, the "power to explain" is nothing over and above the explainer itself, and hence this power does not require a substantive account. The thought is this: if we invoke primitive explainers, such as essences or laws, then we don't need an additional account, – involving perhaps yet more primitive notions, – to relate our primitive explainers to explanation; once we posit explanatory phenomena, we get explanation for free. I will discuss two versions of this *triviality objection*. On the first version of the objection, explanation reduces to an explanatory phenomenon together with other "mundane facts". On the second version, explanatory phenomena come already equipped with the power to explain.

For the first version of the triviality objection, let L(A) be the toy-law, which says that all perfectly hit windows shatter, let *p* be the fact that some particular rock perfectly hits a particular window w, and let *q* be the fact that w shatters. The view under consideration says that "p explains q" reduces to the conjunction of the three facts, L(A), p, and q. For an explanation to obtain simply is for the law, the cause, and the effect to obtain. Now, this proposal is not plausible as it stands, as we must also coordinate the three facts L(A), p, and q. We must say that the fact-pair <p, q> "matches" the law or that we can "subsume" the pair under the law. One way to cash this out is the deductive-nomological account of explanation, which says that L(A) subsumes <p, q> just in case A and p logically entail q. This view reduces "p explains q" to the conjunction of L(A), p, and q together with the fact that A and p logically entail q. The simple deductive-nomological account fails for well-known reasons, but unificationist elaborations of the view are still in contention.[15] These accounts reduce explanation to explanatory phenomena together with "mundane" facts that constitute a relationship of subsumption. If they are correct, we don't need to invoke a mysterious "power to explain" or similar hefty metaphysical resources.

The problem with such reductive proposals is that subsumption views only work for systematizing explanations, and not for generative explanations. Subsumption views have a certain conjunctive character that conflicts with generative explanations. The relation of subsumption coordinates the fact involving the explanatory phenomenon, L(A) in our example, with the subsumed *explanans*, p, and *explanandum*, q. If p and q have the relevant "shape" for subsumption under the law-fact, the mere conjunction of the three facts suffices for explanation. Intuitively speaking, however, the three phenomena are merely set next to one another, like beads on a rosary, and there is no sense in which the law generates q based on p. Explanation by subsumption, therefore, only captures systematizing explanations. We cannot reduce the power to explain to explanatory phenomena plus mundane facts.

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[15] Kitcher (1989) develops unificationism for causal explanation. Kovacs (2020) extends the idea to non-causal kinds of explanation.

This brings us to the second version of the triviality objection, which suggests that the power to explain is "built into" explanatory phenomena. Paraphrasing Jonathan Schaffer (2016a), it is the business of explanatory phenomena to explain. To illustrate this proposal, consider someone who, after having thought long and hard about causation, rejects humean theories because they do not support generative causal explanations. She becomes convinced even that laws of nature are fundamental constituents of reality, as every attempt to ground them in something else undermines their power to explain. When we then demand from her that she equip her fundamental laws with an additional power to explain, she complains that she posited laws precisely as phenomena which possess such a power. She says: "My positing the laws includes my positing of the power. I don't have to make two separate posits: the laws and their power." If she is right, she gets the power to explain for free.

But what exactly could it mean that the power to explain is built into explanatory phenomena? A natural way to understand this says that explanatory phenomena by their very essence entail explanations. It might thus be essential to laws of nature that if the law-fact obtains together with a putative cause, then the cause together with the law-fact explains the effect; the inference from law to explanation is essential to the law. Or put more simply, it might be essential to laws that if laws obtain, then they entail the associated causal regularities.[16] If we generalize this proposal to all explanatory phenomena, we say that what they have in common is that their essences include an entailment from the phenomena to explanation. So, when the explanatory phenomenon is in place, its own essence guarantees that it exercises its power to explain. It is sometimes helpful to use symbols to keep track. I will use "$E_x p$" to say that p holds in virtue of the essence of x, "Lp" to say that p is a law of nature, and "$\models p$" to say that p is a logical truth. We can now state the view as follows:

Essential-Explanation Account: Essences, laws, and logic explain because they all essentially entail explanations, i.e.

- $E_E(E_x p \supset E_x p$ explains p)
- $E_L(Lp \supset Lp$ explains p)
- $E_\models(\models p \supset \models$ explains p)

Note that our theorist's attempt to dodge the question has turned into a genuine account of the power to explain. But one might still say that the account isn't substantial because it does not use something other than explanatory phenomena and explanation.

Now, the Essential-Explanation Account would save us a lot of trouble, as it would free us from having to account for the power to explain in independent terms. But I don't think that this should satisfy us. The main problem with the account is its lack of ambition. It simply takes explanation as a brute phenomenon and says that the essence of explainers guarantees the obtaining of that phenomenon. It sheds no light on what explanation is, other than that it follows from certain phenomena. It does nothing to illuminate what explanation, the interaction between explainer and world, consists of.[17] We should at least try to elucidate generative

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[16] Rosen (2017) invokes essences that carry explanation in the consequent like "it is essential to disjunction that if p obtains, then p explains that 'p or q'" obtains. The difference here is that the bearer of the essence features in the consequence. One could argue that only the essence of explanatory phenomena says what these phenomena would explain. Berker (2019) calls principles akin to these essences "explanation-involving".

[17] The situation is similar to certain powers-theories, which say that it is essential to natural property F that if something is F, then it has power P. While these authors claim to produce sufficient grounds for P-facts, they have

explanations because they are mysterious and ubiquitous. Explainers "reach into the world" to "produce" or "make" or "bring about" facts. We are staggering around with such metaphors, wanting for a philosophical analysis. That we have all those metaphors, which we hold dear but cannot explicate, shows that we expect a philosophical analysis. It would be a philosophical disappointment if we couldn't elucidate generative explanations. That's why I develop a substantive account of the power to explain, which I turn to next.[18]

5. The Modal-Axiomatic Account

We cannot reduce the power to explain to explanatory phenomena and we are not yet ready to concede that generative explanations are metaphysically primitive. We must, finally, turn towards an analysis of the power to explain, and what better place to start than with David Hume? We know Hume as a deflationist or even sceptic about causation. But his scepticism is owed in part to the richness of the notion of causation that he starts out with (although he would have insisted that this rich notion is in a certain sense defective):

> I begin with observing that the terms of *efficacy, agency, power, force, energy, necessity, connexion, and productive quality*, are all nearly synonymous; and therefore 'tis an absurdity to employ any of them in defining the rest. (T 1.3.14.4)

We can use any of these expressions to characterize explanatory phenomena. They exert efficacy, agency, power, force, energy, and necessity; they establish a connection and possess a productive quality. From this list, necessity is arguably the best suited notion for metaphysical theorizing. Developments over the last decade, in modal logic and in modal theorizing at large, have helped us overcome Hume's empiricist scruples about necessity. Surely there is a genuine concept here! And necessity is also less metaphorical a notion than many of the others. Hume suggests that we cannot "define" causation or explanation in terms of necessity. I am not sure whether I agree with this claim. But I propose that we can ground the power to explain in the relationship between explanatory phenomena and necessity.

The proposal that necessity precedes explanation is, of course, not new. David Armstrong, a staunch "anti-humean" about laws of nature, accounts for their power to explain in terms of necessity.[19] Armstrong (1983) introduces a relation he calls "Nomic Necessitation". The regularity that all Fs are Gs is a law of nature, just in case Nomic Necessitation relates the universal F to the universal G. The name "Nomic Necessitation" indicates a modal connection, which Armstrong spells out as follows: it is metaphysically necessary that if F relates by Nomic

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said nothing to explain what powers, such as P, are. Pending additional bits of theory, they are powers-primitivists. See Jaag (2014) for discussion.

[18] Rosen (2017) suggests a different essence-based account of the power to explain. He says that laws of nature explain because they essentially entail certain causal regularities. Generalizing from this proposal, one could analyze the power to explain in terms of an essential inference from the explanatory phenomena to an associated fact. This proposal also resembles the account of governance in Schaffer (2016a). Instead of $E_L(Lp \supset Lp$ explains p), the account would use $E_L(Lp \supset Lp)$. One obvious difficulty for this proposal is that many phenomena essentially entail facts. Knowledge, for instance, essentially entails the known fact. And even non-governing humean laws essentially entail the associated regularity. I have criticized the view in Wilsch (2018). I would add that my own account, which I develop in this chapter and the next, has more explanatory power.

[19] Fred Dretske (1977) and Michael Tooley (1977) have developed similar proposals. Armstrong's work is the most widely known, owed to the quality and the quantity of his texts on the issue of properties and laws.

Necessitation to G, then all Fs are Gs. Where R is Nomic Necessitation and N is metaphysical necessity, we can state this modal connection as follows:

Armstrong's Necessitation: $N(R(F, G) \supset$ All Fs are Gs$)$

Following Armstrong, we could understand the laws' "power to explain" in terms of this modal principle: laws explain because they necessitate causal regularities. This is what it takes for laws to "govern" the facts and to establish explanations.[20]

Armstrong's own account is too narrow for our purposes, as it targets only laws of nature, while we want to account for the power to explain in general. But we can generalize the account to other explanatory phenomena. To generalize the proposal, we can replace Armstrong's relation Nomic Necessitation with the operator, "it is a law of nature that". I will leave it open whether we should ground facts of the form "it is a law of nature that p" in facts involving relations between universals. This is in line with my intention to remain neutral on the ontology of explanatory phenomena. For all I know, laws and other explanatory phenomena may be mere ideology. We can then restate Armstrong's account as follows: laws have a power to explain because the fact *It is a law that p* necessitates *p*. We can generalize this schema beyond laws of nature to all putative explanatory phenomena.

I will use monadic sentential operators to represent essences, laws, and logic. I use Fine's expression "It is essential to x that p" to express that p is an essential truth that obtains in virtue of the essence of phenomenon x. We can similarly say that it is a logical truth or a metaphysical law that p. Since sentential operators have a scope, I will also speak of the facts that are "in the scope" of the explanatory phenomena. Hence, if it is a natural law that p, then p is in the scope of the natural laws, and if it is an essential truth that p, then p is in the scope of essence. The simple Armstrongian proposal says that phenomena are explanatory, or have the power to explain, if and because they necessitate the facts in their scope. Using "S" as a schematic letter for putative explanatory phenomena,[21] we can put this as follows:

Simple Necessitation-Based Account: Phenomenon S has a power to explain just in
                                            case S necessitates the facts in its scope.

A well-known difficulty for Armstrong's original account, the so-called *inference problem*, is that it gives no explanation for the claim that facts involving laws of nature necessitate the causal regularities in their scope. The necessary entailment from law to regularity appears to be a brute posit, which many have considered problematic. The inference problem, moreover, generalizes to all explanatory phenomena. For, according to the Simple Account, every explanatory phenomenon necessitates the facts in its scope (where p can be replaced with arbitrary propositions and $\supset$ is the material conditional):

Necessitation $N(S(p) \supset p)$

For every putative explanatory phenomenon, we must explain why it necessitates the facts in its scope, or else accept that necessitation-facts as an instance of brute modality. The inference-problem is not a knock-down argument against the Simple Account, as one could respond by

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[20] Armstrong had much more to say about the governance of laws concerning the ontology of laws as states-of-affair types. These elaborations aren't relevant to the following discussions.

[21] "S" stands for source. I will argue in Chapter 2 that explanatory phenomena are sources of necessity. I use S as a schematic letter for explanatory phenomena throughout the book.

accepting unexplained necessitation-facts. I will return to the inference-problem below. But first I want to highlight the most glaring problem of the account: the Simple Account does not deliver sufficient conditions for the power to explain, as there are phenomena that necessitate but which do not have a power to explain. It is necessary, for instance, that if a proposition is true, or known, or fundamental, then the corresponding fact obtains. Yet, truth, knowledge, and fundamentality have no explanatory influence on the world; they don't establish explanations. Necessitation simply doesn't suffice for explanation.

Although the argument against the Simple Account is decisive, it would be too quick to reject the modal approach altogether. The idea has much intuitive appeal: explanatory phenomena establish explanations by exerting necessity onto the facts. I suggest that we salvage a version of the account. To this end, I will distinguish "mere necessitation" from a more robust notion of "exertion": while all factive phenomena necessitate facts in their scope, only certain select phenomena *exert* necessity on those facts. To distinguish mere necessitation from necessity exertion, I will draw a distinction between "true for" and "axiomatic for". Modal principles like Necessitation are merely true for some phenomena, and they are axiomatic for others. If a suitable modal principle is axiomatic for a phenomenon, then the phenomenon does not merely necessitate certain facts, but it exerts necessity on those facts. That's the idea that I will now make precise.

If we have a suitable notion of "axiomatic for", we can distinguish mere necessitation from necessity-exertion. Another advantage, which will become clear in Chapter 2, is that we can use different modal principles to characterize different explanatory phenomena. To give an example, Martin Glazier (2017) has recently suggested that essences explain by making essential truths necessary. It is quite natural to capture this view not in terms of necessitation, but in terms of an entailment to necessity:

Necessity $Sp \supset Np$

If Necessitation is axiomatic for some explanatory phenomena, Necessity might be axiomatic to others. Specifically, a development of Armstrong's account of laws would perhaps say that Necessitation is axiomatic for laws, and a development of Glazier's idea would perhaps propose that Necessity is axiomatic for essence. What all explanatory phenomena have in common, I claim, is that they all have modal axioms, and thus they all exert necessity on facts. In Chapter 2, I will develop a complete roster of modal axioms. I will argue there that different modal axioms constitute different manners of exerting necessity, and thus account for the differences in the ways in which distinct explanatory phenomena interact with the world.

As it stands, "axiomatic for" and "modal axiom" are just expressions waiting to receive a more determined meaning. But the functional characterization of the notion as that what distinguishes mere necessitation from necessity exertion, suffices to at least state the account that I will investigate in this book: The Modal-Axiomatic Account of explanatory phenomena says that a phenomenon is explanatory just in case and because it features in a modal axiom, or just in case and because there is a suitable modal principle, which is axiomatic for it. This is the letter of the account. I will next provide the content.

6. The Modal-Essentialist Account

"Axiomatic for" is just an expression for whatever special status turns a modal principle into a principle that characterizes the exertion of necessity. One constraint on the notion is that it should provide a solution to the inference-problem. We should be able to say that laws necessitate facts because that is axiomatic to them. This suggests that "being axiomatic for" is itself an explanatory phenomenon. How then should we understand this axiomatic status? Since I intend the axiomatic status to ground the power to explain, it must be suitably metaphysical, rather than conceptual or epistemic.[22] I will discuss five options in terms of the following phenomena:

- Option 1: Fundamentality
- Option 2: A *sui generis* status
- Option 3: Law
- Option 4: Logical Truth
- Option 5: Essence

One disclaimer is in order before we dive into the options. I will argue for Option 5, the analysis of modal axioms in terms of essence. However, I consider the five options as friendly competition. I will assume throughout this book, that one particular version of the Modal-Axiomatic Account can be made work. Seeing that we have plenty of options to interpret the notion of a modal axiom should add credibility to that assumption. That said, I will discuss the options in turn.

According to Option 1, a modal principle like Necessitation is axiomatic for explanatory phenomenon S, just in case it features S and is fundamental, which means that it is not grounded in any other facts. For instance, if Necessitation is axiomatic for laws, then $N(Lp \supset p)$ is a fundamental fact, and if Necessity is axiomatic for essence, then $E_xp \supset Np$ is a fundamental fact. We can state this proposal schematically as follows:

- It is fundamental that it is necessary that if p is a law then p: $F(N(Lp \supset p))$
- It is fundamental that if p is essential (to some x), then p is necessary: $F(E_xp \supset Np)$.

If this is the correct criterion for modal axioms, then fundamental, ungrounded modal principles determine explanatory phenomena. Fundamentality is a natural stand-in for axiomaticity, as axioms evade the demand for explanation. This account distinguishes explainers from ordinary factive phenomena. For, although truth and knowledge are factive, we can explain their factivity with the correct account of what knowledge and truth are; they are not fundamentally factive. The factivity of explanatory phenomena, in contrast, would have no explanation.

One problem for Option 1 is that it runs straight into the inference-problem, the problem of explaining modal principles like Necessitation. We can, of course, posit fundamental necessity-facts, but it is difficult to shake the feeling that necessity requires explanation. If some fact obtains at all possibilities, then there is surely an explanation for that.[23] The question of whether there are fundamental necessity-facts will resurface in the next two chapters. I will argue

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[22] That rules out the proposal in Schaffer (2016a) that the entailment is merely conceptual.

[23] The desire to ground necessities in underlying hyperintensional phenomena is also a crucial theme of the current zeitgeist, which I have discussed in the Introduction. James van Cleve (2018) has argued recently that there is nothing wrong with fundamental necessity-facts.

against that view in Chapter 3 on more principled grounds. Here I only state my commitment to avoiding fundamental necessity-facts.

Option 2 assigns a *sui generis* status to the modal principles. We could, to that end, introduce an axiom-operator, A, which applies to a phenomenon and assigns to that phenomenon a modal principle that characterizes the way in which it exerts necessity. We could use "A" to make claims such as A(Laws)(Necessitation) or A(Essence)(Necessity). But admitting such a primitive notion is obviously a concession, even if, as I will argue throughout this book, the notion of a modal axiom can do important explanatory work. It could turn out that reductive analyses of "axiomatic for" fail. But it is far too early to take this option seriously.

Options 3 through 5 have in common that they assign a "double role" to one of the explanatory phenomena. According to Option 3, laws exert necessity, and laws also make it so that certain phenomena exert necessity. It treats modal axioms, such as Necessitation and Necessity, as laws. Assuming that Necessitation is axiomatic for laws and Necessity is axiomatic for essence, we get the following principles:

- It is a law that it is necessary that if p is a law then p: $L(N(Lp \supset p))$
- It is a law that if p is essential (to some x) then p is necessary: $L(E_xp \supset Np))$

This proposal is obviously dissatisfying if we restrict our notion of law to laws of nature. For, this is simply not what we expect laws of nature to do. Laws of nature concern the behaviour of concrete things in space and time; they do not relate abstract phenomena like essence or logical consequence to necessity and the facts in their scope.

We could instead think of modal axioms as metaphysical laws. On my own view about metaphysical laws, which I develop in Chapter 6, this suggestion can't be right, because on that conception, metaphysical laws concern ontological operations like parthood or constitution. Setting that aside, laws of nature and laws of metaphysics, arguably, are input-output mechanisms that take facts to other facts. This fits their intuitive role description, according to which laws develop facts along the temporal dimension and the dimension of fundamentality. This means that we can always, at least in principle, construe law-facts as scoping over conditionals, $L(A \supset B)$, to suggest that the law takes the antecedent, A, to the consequent B. But Necessitation does not have conditional form, as the material conditional is not the main connective. Necessitation simply says that laws necessitate what's in their scope, period. I am, therefore, hesitant to think of modal axioms as metaphysical laws.

Option 4 is the intriguing idea that the connection between explanatory phenomena, necessity, and the world is a matter of logic; modal axioms would be logical truths. Consider our now familiar examples for illustration:

- It is a logical truth that it is necessary that if p is a law then p: $\vDash(N(Lp \supset p))$
- It is a logical truth that if p is essential, then p is necessary: $\vDash(E_xp \supset Np))$

This idea clashes with the topic-neutrality of logic if phenomena such as essences and laws are too substantive, or too specific to count as logical constants. Our standard conception of logic includes only logical connectives, quantifiers, and identity among the logical constants. On the other hand, there is the nagging suspicion that we currently do not have much of a conception of the metaphysical role of logic anyways. And so, construing logic as the mark of explanatory phenomena might give logic an interesting metaphysical purpose.

To get a feel for the suspicion, ask yourself whether the constants of modal logic, necessity and possibility, are genuine logical constants, or whether the constants of epistemic logic, knowledge and epistemic possibility, are genuine logical constants. I would say that while necessity might be a genuine logical constant, knowledge certainly isn't one. But then again, it is hard to say what criteria might even help us answer such questions. Hence, the suspicion that we don't really know what logic does. Considering this suspicion, Option 4 offers an interesting vision: one of logic's roles is to select the explanatory phenomena by forging connections between them, necessity, and the world.

Although Option 4 is intriguing, I don't know of anything else to say in its favour. Moreover, we might suggest that paradigmatic basic logical truths are not only *a priori* knowable but also plain and obvious; the modal principles that characterize explanatory phenomena, in contrast, may not be quite as obvious. There is no absurdity in claiming that some essential truth is not necessary, or much less absurdity than in claiming that both p and not p are the case.[24] That observation might tell against utilizing logical truth: modal axioms are not sufficiently obvious, and their negations don't "feel" the way logical contradictions feel.

This leaves us with Option 5, the view that modal principles have axiomatic status if they belong to the essence of the explanatory phenomenon in question:

- It is essential to laws that it is necessary that if p is a law then p: $E_L(N(Lp \supset p))$
- It is essential to essence that if p is essential, then p is necessary: $E_E(E_xp \supset Np))$

The notion of a modal essence nicely captures the metaphorical idea that explanatory phenomena "carry necessity within them" to exert them on the facts, as to occur in the essence of a phenomenon is one way of being present within that phenomenon. If the content of an essence characterizes a modal connection between a phenomenon and certain facts, then that essence captures that the phenomenon "exerts necessity on facts". That's the idea.

The notion of essence is quite flexible. We are free to posit essences we need for our theoretical purposes. The notion of essence at least is not subject to the same constrains as the notions of fundamentality, law, and logical truth. It should, therefore, be less problematic to consider modal principles like Necessitation and Necessity as essential to explanatory phenomena. It is also independently plausible that explanatory phenomena have modal essences. It is plausible that it lies in the very nature of laws that they necessitate causal regularities, or that it lies in the very nature of essence that they entail necessity. For these reasons, Option 5 strikes me as the best analysis of the axiomatic status of those modal principles that characterize explanatory phenomena. That said, I do not consider Options 1 through 4 as entirely out of the running. We could do much of what I will do in the following chapters in terms of one of the other options. It would be interesting to see these alternative options in action.

We thus reach the Modal-Essentialist Account of the power to explain. The account says that a phenomenon is explanatory because it has a suitable modal essence, which is an essence that features necessity. (More on suitability below.) Modal essences constitute the power to explain. This is a version of the Modal-Axiomatic Account, which understands the notion of a modal axiom in a particular way: modal axioms just are suitable modal essences.

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[24] Jessica Leech (2018) argues that some essential truths are not even necessary.

To be an explanatory phenomenon is to possess a power to explain. Modal axioms bestow phenomena with that power, and they also help to elucidate how the phenomenon exercises that power to establish explanations. A more detailed account of the modal axioms and their relationship to explanations will be the topic of Chapter 2. I will here only provide a taste of the idea to illustrate the relationship between modal axioms and explanation. Necessitation and Necessity are two candidate modal principles, which, if essential, characterize distinctive ways of explaining facts. If Necessitation is essential to phenomenon S, then S explains the facts in its scope directly; if Necessity is essential to S, then S primarily explains the necessity of the facts in its scope. We can illustrate these connections with the following explanatory patterns:

Essential Necessitation

1. $E_S(N(Sp \supset p))$
2. Sp
3. p

Essential Necessity

1. $E_S(Sp \supset Np)$
2. Sp
3. Np

Every explanatory phenomenon displays such explanatory patterns, which the modal essences of that phenomenon determine. Each modal essence corresponds to a distinctive explanatory pattern. I will survey different modal essences in Chapter 2, and I will investigate their relationship to explanation in more detail. We will see that the notion of a modal axiom (and thus a modal essence) will provide us with many resources to characterize the different ways in which distinct explanatory phenomena interact with the world. Here I use Necessitation and Necessity as illustrative examples.

7. Objections and Clarifications

We have accomplished the main goal of the current chapter. I have introduced the Modal-Axiomatic Account and my preferred version, the Modal-Axiomatic Account. I have explained why we need an account along those lines. We can summarize the three steps of the argument as follows. First, we need to provide an illuminating account of the power to explain, one which applies to all explanatory phenomena, whatever they are. Secondly, plausible attempts will use the notion of necessity. And the modal-axiomatic account is the best sort of account that can provide a sufficient condition for the power to explain. Now, this argument can only be sound if the Modal-Axiomatic Account works. I close this chapter with a defence of the account against some of the more obvious objections.

The first objection is that while modal essences may constitute a power to explain, I have said nothing to further explicate the step from modal essence to the associated explanatory behaviour. Doesn't this mark a lacuna of the proposal? I don't think so. For, each modal essence constitutes a power to explain, and such a power simply manifests in explanatory behaviour. Perhaps the more pressing question is then why modal essences constitute a power to explain. But this question is odd because the proposal says that to have a power to explain just is to have a modal essence. If the reader still insists that the step from modal essence to explanatory behaviour remains brute and should thus be recognized as a cost of the view, then so be it. I claim, and I hope to show this throughout the book, that the posited connection between modal essences and explanatory behaviour constitutes a powerful apparatus that sheds light on a range of otherwise deeply puzzling phenomena surrounding explanation and necessity.

The second objection targets the double role that essences play on the Modal-Essentialist Account. Since essence is an explanatory phenomenon, essence itself has a modal essence. I will claim in Chapter 2 that the modal essence of essence includes "$E_E(E_x p \supset Np)$", which features three consecutive essence-operators. This essence says that it is essential to essence that every essential truth is also necessary. While that essence-claim might look bewildering at first, there is nothing surprising about the idea that essence has an essence. Every phenomenon that we can characterize at all has an essence. Essence is such a phenomenon. Now, one might worry that the essence of essence involves problematic circularity. For, must essence be an explanatory phenomenon already before it can make itself an explanatory phenomenon? The short answer is "no".

The longer answer emphasizes that essence plays a double role on our account. On the one hand, modal essences give explanatory phenomena their power to explain. Thus, if laws of nature have a modal essence, then it is the essence of laws which determines that laws of nature are an explanatory phenomenon. We can say that essences are *constitutive for explanation*. On the other hand, essences are themselves explanatory phenomena. I claim that these two roles are independent. It is not the case that essences are constitutive for explanation because they are explanatory phenomena. If a suitable modal principle is essential to a phenomenon, that by itself suffices for the explanatory power of the phenomenon in question, or so says the Modal-Essentialist Account. If we keep this in mind, we avoid the threatened circularity.

So much for the relationship between modal axioms and explanation. The remaining objections concern the extensional adequacy of the Modal-Essentialist Account. If that account is correct, having a modal essence is a rare distinction and not a common occurrence. Ordinary phenomena like you and me don't have modal essences, only essences, laws, and logical consequence do, as well as any other explanatory phenomena if there are more. But is this correct? If we are essentially human, then we are also necessarily human. Can't we infer from these claims that it is also part of our essence that we are necessarily human? If so, ordinary things like us have modal essences after all.

I have two responses to this objection. The first one is that from a metaphysical point of view, there is an intuitive distinction to be drawn between necessities that are a consequence of an essence and necessities that are included in an essence. I suggest that our shared necessary humanity is a consequence of our respective essences, and that the principles like Necessitation and Necessity are included in the essences of explanatory phenomena. However, if you insist that our necessary humanity is not merely a consequence of our essences but also included in them, then this is also fine by me. For, I will then insist on Fine's distinction between constitutive and consequential essences. Only the constitutive essence concerns the essential core of the bearer of the essence. Consequential essences are derivative; they are downstream from constitutive essences. I am happy to concede that our necessary humanity is included in our respective consequential essences, as long as we understand the Modal-Essentialist Account as referring to constitutive essence.

Even if there is no inference from ordinary essences to modal essences, we might still worry that there are counterexamples to the alleged sufficiency of modal essences for explanation. One such counterexample comes from necessity itself. If any fact is essential to necessity, it will surely feature necessity. Necessity, therefore, has a modal essence if it has an essence at all. But necessity is not an explanatory phenomenon; it only helps to account for explanatory

phenomena. Since necessity has a modal essence but is not an explanatory phenomenon, having a modal essence does not suffice for the power to explain. A second counterexample concerns gerrymandered phenomena. We could define the notion of *N-belief* to apply to beliefs that are necessarily true: S N-believes p I and only if S believes p and it is necessary that p. If this sort of definition picks out the essence of N-belief, then the essence is modal, as it features a modal operator. So, N-belief has a modal essence, but it is not an explanatory phenomenon.

These counterexamples are not very troubling. To deal with the first example, we can exclude necessity manually from the explanatory phenomena: explanatory phenomena are phenomena with modal essences *other than necessity itself*. This exclusion is reminiscent of Fine's (1995a) definition of ontological dependence, according to which x depends on any object *other than x itself* which features in x's essence. The manual exclusion seems equally principled in both definitions. In both cases, it is the distinctness between the bearer of the essence, and the relevant phenomenon that prevents the essence from establishing the relationship it commonly establishes. For, surely nothing depends on itself, and nothing exerts itself (in our specific sense of exertion). These exceptions should not deter us from using essence to account for dependence or exertion.

The second counterexample relies on the defined-up nature of N-belief. To deal with this sort of example, I suggest that we recognize only those phenomena as explanatory, which do not have "contrived" exhaustive definition. I am not sure how exactly to understand "contrived" here. If all else fails, I require that explanatory phenomena don't have any exhaustive real definitions, by which I mean definitions that state both necessary and sufficient conditions for the obtaining of the phenomenon I question. N-belief has such a definition, as for someone to have a certain N-belief just is for them to believe a necessary truth: believing a necessary truth is necessary and sufficient for N-belief. It is plausible that essence, laws, logic, and other putative candidate sources do not have exhaustive definitions, especially from my anti-humean and hyperintensionalist viewpoint (compare §5, §7 of the Introduction).

8. Conclusion

I have argued that essences, laws, and logic form the class of explanatory phenomena, which establish distinct kinds of explanations. The explanations they establish are generative in that they amount to a genuine making-it-so. I have argued, moreover, that the power to establish generative explanations requires a substantive account. Contrary to a widespread opinion, when non-humean philosophers posit primitive laws, or essences, or logical connections, they are not done. They also need to explain how their primitive posits manage to explain; and that story may involve further posits. My own view is that necessity holds the key to the power to explain, explanatory phenomena explain in virtue of exerting necessity on facts. I have developed an account of this metaphorical notion of exertion in terms of modal essences: for a phenomenon to exert necessity on facts, to be a source of necessity, is for it to have a suitable modal essence.

So much for the commonalities among essences, laws, and logic. In Chapter 2, I will explain how different modal essences characterize distinct manners of exerting necessity on facts. This will allow us to explain the different ways in which explanatory phenomena interact with the world. The influence that essences or logical consequence exert on the world is quite different from the influence exerted by the laws of nature. I will explain how we can account for those differences with their respective "manners of exertion". But the details will have to wait until

the second part of the book, where I discuss the four sources one by one. I will then explain in Chapter 3 that the view I have defended here, on which necessity exertion enables explanation, leads to a primitivist and pluralist position about necessity. These views on the nature of necessity give rise to the *problem of the necessity of sources* and to the *problem of relative modal strength*. I develop my solution to those problems in Part III, which aims to explain how different sources of necessity cooperate.

Bibliography

Alvarez, Maria 2016, Reasons for Action: Justification, Motivation, Explanation, *The Stanford Encyclopedia of Philosophy*, https://plato.stanford.edu/entries/reasons-just-vs-expl.

Amijee, Fatema 2021, Explaining Contingent Facts, *Philosophical Studies* 178 (4):1163-1181.

Armstrong, David 1983, *What is a Law of Nature?*, Cambridge University Press.

Armstrong, David 1989, *A Combinatorial Theory of Possibility*, Cambridge and New York: Cambridge University Press.

Armstrong, David 1989b, *Universals: An Opinionated Introduction*, Westview Press.

Armstrong, David 1997, *A World of States of Affairs*, Cambridge: Cambridge University Press.

Barcan Marcus, Ruth 1966, Iterated Deontic Modalities, *Mind* 75 (300):580-582.

Beebee, Helen 2000, The Non-Governing Conception of Laws of Nature, *Philosophy and Phenomenological Research* 61, 571–594.

Bennett, Karen 2011a, By Our Bootstraps, *Philosophical Perspectives*, xxv: 27–41.

Bennett, K. 2011b. Construction Zone: No Hard Hat Required. Philosophical Studies 154: 79–104.

Berker, Selim 2019, The Explanatory Ambitions of Moral Principles, Noûs 53 (4):904-936.

Bernstein, Sarah 2016, Grounding is not Causation, *Philosophical Perspectives* 30 (1):21-38.

Bigelow, John 1988, *The Reality of Numbers: A Physicalist's Philosophy of Mathematics*, Oxford, England: Oxford University Press.

Bigelow, John, Ellis, Brian, and Lierse Caroline 1992, The world as one of a kind: Natural necessity and laws of nature, *British Journal for the Philosophy of Science* 43 (3):371-388.

Bird, Alexander 2004, Strong necessitarianism: The nomological identity of possible worlds, *Ratio* 17 (3):256–276.

Bird, Alexander 2007, *Nature's Metaphysics: Laws and Properties*, Oxford university Press.

Bird, Alexander 2010, Causation and the Manifestation of Powers, In Anna Marmodoro (ed.), *The Metaphysics of Powers: Their Grounding and Their Manifestations*, Routledge.

Blackburn, Simon 1986, Modality and Modals, In *Essays in Quasi-Realism*, Oxford University Press.

Bovey, Gaétan 2021, Essence, Modality, and Intrinsicality, *Synthese* 198 (8):7715-7737.

Bovey, Gaetan forthcoming, Essence, Modality, and Circularity, *Philosophical Studies*.

Broome, John 2015, Reasons versus ought, *Philosophical Issues* 25 (1):80-97.

Burgess, John 1997, Quinus ab Omni Nævo Vindicatus, *Canadian Journal of Philosophy* 27:25-65.

Cameron, Ross 2007, The Contingency of Composition, *Philosophical Studies* 136 (1):99-121.

Cameron, Ross 2008, Truthmakers, Realism, and Ontology, *Royal Institute of Philosophy Supplement* 62:107-128.

Cameron, Ross 2009, What's Metaphysical About Metaphysical Necessity?, *Philosophy and Phenomenological Research* 79 (1):1-16.

Cameron, Ross 2010, On the Source of Necessity, In Bob Hale & Aviv Hoffmann (eds.), *Modality: Metaphysics, Logic and Epistemology*, Oxford University Press

Carnap, Rudolf 1947, Meaning and Necessity: A Study in Semantics and Modal Logic, Chicago, IL, USA: University of Chicago Press.

Carrol, John 1994, *The Laws of Nature*, Cambridge: Cambridge University Press.

Chalmers, David 1996, *The Conscious Mind: In Search of a Fundamental Theory*, Oxford University Press.

Correia, Fabrice 2006, Generic essence, objectual essence, and modality, *Noûs* 40 (4):753–767.

Correia, Fabrice 2012, On the Reduction of Necessity to Essence, *Philosophy and Phenomenological Research* 84 (3):639-653.

Correia, Fabrice and Skiles, Alexander 2019, Grounding, Essence, and Identity, *Philosophy and Phenomenological Research* 98 (3):642-670.

Correia, Fabrice and Skiles, Alexander 2021, Essence, Modality, and Identity, *Mind*, fzab017, https://doi.org/10.1093/mind/fzab017.

Dasgupta, Shamik 2009, Individuals: An Essay in Revisionary Metaphysics, *Philosophical Studies* 145 (1):35-67.

Dasgupta, Shamik 2014, The Possibility of Physicalism, *The Journal of Philosophy*, 111(9): 557-592.

Dasgupta, Shamik 2016, Metaphysical Rationalism, *Noûs* 50 (2):379-418.

De Rizzo, Julio 2022, A ground-theoretical modal definition of essence, *Analysis* 82 (1):32-41.

deRosset, Louis 2013, Grounding Explanations, *Philosophers' Imprint*, xiii: 1–26.

Dorr, Cian 2005, What we disagree about when we disagree about ontology, In Mark Eli Kalderon (ed.), *Fictionalism in Metaphysics*. Oxford University Press. pp. 234-86.

Dretske, Fred 1977, Laws of Nature, *Philosophy of Science* 44 (2):248-268.

Dummett, Michael 1959, Wittgenstein's Philosophy of Mathematics, *The Philosophical Review* Vol. LXVIII, pp.324-48.

Eagle, Antony 2018, Chance versus Randomness, *The Stanford Encyclopedia of Philosophy*, https://plato.stanford.edu/entries/chance-randomness.

Earman, John 1986, *A Primer on Determinism*, Dordrecht: D. Reidel Publishing Company.

Etchemendy, John. 1990, *The Concept of Logical Consequence*. Harvard University Press.

Fine, Kit 1991, The Study of Ontology, Noûs 25 (3):263-294.

Fine, Kit 1994a, Essence and Modality, *Philosophical Perspectives* 8 (Logic and Language):1-16.

Fine, Kit 1994b, Senses of Essence, in W. Sinnott-Armstrong, D. Raffman & N. Asher (eds.), *Modality, Morality and Belief. Essays in Honor of Ruth Barcan Marcus*, Cambridge University Press.

Fine, Kit 1995a, Ontological Dependence, *Proceedings of the Aristotelian Society* 95 (1):269-290.

Fine, Kit 1995b, The Logic of Essence, *Journal of Philosophical Logic* 24 (3):241-273.

Fine, Kit 2001, The Question of Realism, *Philosophers' Imprint* 1: 1-30.

Fine, Kit 2005a, *The Varieties of Necessity*, in K. Fine, *Modality and Tense: Philosophical Papers*, Oxford University Press, pp. 235-260.

Fine, Kit 2005b, Necessity and Non-Existence, in K. Fine, *Modality and Tense: Philosophical Papers*, Oxford University Press, pp. 321-354.

Fine, Kit 2005c, The Problem of *De Re* Modality, in K. Fine, *Modality and Tense: Philosophical Papers*, Oxford University Press, pp. 40-104.

Fine, Kit 2005d, Tense and Reality, in in K. Fine, *Modality and Tense: Philosophical Papers*, Oxford University Press, pp. 261-320.

Fine, Kit 2009, The Question of Ontology, In D. Chalmers, D. Manley & R. Wasserman (eds.), *Metametaphysics: New Essays on the Foundations of Ontology*, Oxford University Press. pp. 157-177.

Fine, Kit 2010, Towards a Theory of Parts, *Journal of Philosophy* 107 (11):559-589.

Fine, Kit 2015, Unified Foundations for Essence and Ground, *Journal of the American Philosophical Association* 1 (2):296-311.

Glazier, Martin 2017, Essentialist Explanation, *Philosophical Studies* 174 (11):2871-2889.

Glazier, Martin 2017, The difference between epistemic and metaphysical necessity, *Synthese* 198 (Suppl 6):1409-1424.

Hale, Bob 2002, The Source of Necessity, *Noûs* 36 (s16):299-319.

Hale, Bob 2013, *Necessary Beings: An Essay on Ontology, Modality, and the Relations Between Them*, Oxford University Press.

Hanks, Peter 2008, A dilemma about Necessity, *Erkenntnis* 68 (1):129-148.

Hempel, Carl Gustav and Oppenheim, Paul 1948, Studies in the Logic of Explanation, *Philosophy of Science* 15 (2):135-175.

Hofweber, Thomas 2016, *Ontology and the Ambitions of Metaphysics*, Oxford, England: Oxford University Press UK.

Hume, David 2007, *The Clarendon Edition of the Works of David Hume: A Treatise of Human Nature, Vol. 1: Texts,* David Fate Norton and Mary J. Norton (eds.), Oxford University Press.

Jaag, Siegfried 2014, Dispositional essentialism and the grounding of natural modality, *Philosophers' Imprint* 14.

Jacobs, Jonathan and Hartman, Robert 2017, Armstrong on Probabilistic Laws of Nature, *Philosophical Papers* 46 (3):373-387.

Jackson, Frank 1993, Armchair Metaphysics, in J. Hawthorne and M. Michael (eds.), *Philosophy in Mind: The Place of Philosophy in the Study of Mind*, Amsterdam: Kluwer, pp. 23–42.

Kim, Jaegwon 1993, Postscripts on Supervenience, in *Supervenience and Mind: Selected Philosophical Essays*: 161–74. Cambridge University Press.

Rosanna Keefe & Jessica Leech 2018, Essentialism and Logical Consequence, In I. Fred Rivera & J. Leech (eds.), *Being Necessary: Themes of Ontology and Modality from the Work of Bob Hale*. Oxford University Press.

Kitcher, Philip 1989, Explanatory Unification and the Causal Structure of the World, In *Scientific Explanation (Minnesota Studies in the Philosophy of Science, Volume 13)*, Kitcher and Salmon (eds.), 1989, Minneapolis, MN: University of Minnesota Press: 410–505.

Kment, Boris 2006, Counterfactuals and the Analysis of Necessity, Philosophical Perspectives 20 (1):237–302.

Kment, Boris 2014, *Modality and Explanatory Reasoning*, Oxford University Press.

Koslicki, Kathrin 2020, Skeptical Doubts, In Michael J. Raven (ed.), *Routledge Handbook of Metaphysical Grounding*. London, UK: pp. 164-179.

Kovacs, David Mark 2020, Metaphysically explanatory unification, *Philosophical Studies* 177 (6):1659-1683.

Kripke, Saul 1980, *Naming and Necessity: Lectures Given to the Princeton University Philosophy Colloquium*, Cambridge, MA: Harvard University Press.

Lange, Marc 2009, *Laws and Lawmakers: Science, Metaphysics, and the Laws of Nature*, Oxford University Press.

Leech, Jessica 2016, The Varieties of (Relative) Necessity, Pacific Philosophical Quarterly 97 (2).

Leech, Jessica 2018, Essence and Mere Necessity, *Royal Institute of Philosophy Supplement* 82:309-332.

Leech, Jessica 2021, From Essence to Necessity via Identity, *Mind* 130 (519):887-908.

Leech, J. 2022, Logical Essence, Argumenta 14.

Lewis, David 1973, *Counterfactuals*, Cambridge, MA, USA: Blackwell.

Lewis, David 1980, A Subjectivist's Guide to Objective Chance, in Richard C. Jeffrey (ed.), *Studies in Inductive Logic and Probability, Volume II*, Berkeley: University of California Press, pp. 263–293.

Lewis, David 1983, New Work for a Theory of Universals, *Australasian Journal of Philosophy* 61, 343–377.

Lewis, David 1986a, *On the Plurality of Worlds*, Wiley-Blackwell.

Lewis, David 1986b, Counterparts or Double Lives, D. in Lewis, *On the Plurality of Worlds*, Wiley-Blackwell.

Lewis, David 1986c, Causal Explanation, In *Philosophical Papers Vol. ii*. Oxford University Press. pp. 214-240.

Lewis, David 1994, Humean Supervenience Debugged, *Mind* 103 (412):473-490.

Leuenberger, Stephan 2014, Grounding and Necessity, *Inquiry: An Interdisciplinary Journal of Philosophy* 57 (2):151-174.

Lowe, Jonathan 2008a, Essentialism, Metaphysical Realism, and the Errors of Conceptualism, *Philosophia Scientiae* 12 (1):9-33.

Lowe, Jonathan 2008b, *Personal Agency: The Metaphysics of Mind and Action*, Oxford University Press.

Mackie, Penelope 2020, Can Metaphysical Modality Be Based on Essence?, in Mircea Dumitru (ed.), *Metaphysics, Meaning, and Modality: Themes from Kit Fine* (Oxford: Oxford University Press), pp. 247-64.

Maudlin, Tim 2004, *Truth and Paradox: Solving the Riddles*, Oxford: Oxford University Press.

Maudlin, Tim 2007, A Modest Proposal Concerning Laws, Counterfactuals, and Explanations, in *The Metaphysics within Physics*, Oxford: Oxford University Press, pp. 5–49.

Meixner, Uwe 1993, Propensity and Possibility, *Erkenntnis* 38 (3):323-341.

Müller, Thomas 2012, Branching in the landscape of possibilities, *Synthese* 188(1), 41–65.

Nolan, Daniel 2011, The Extent of Metaphysical Necessity, *Philosophical Perspectives* 25 (1):313-339.

Norton, John 2003, Causation as folk science, *Philosophers' Imprint* 3:1-22.

Plantinga, Alvin 1947, *The Nature of Necessity*, Oxford: Clarendon Press.

Prior, Arthur 1962, *Formal Logic*, Oxford University Press.

Pruss, Alexander 2006, *The Principle of Sufficient Reason: A Reassessment*, Cambridge University Press.

Quine, W. V. O. 1936, Truth by Convention, *Journal of Symbolic Logic*: 77-106.

Quine, W. V. O. 1951, Two Dogmas of Empiricism, *Philosophical Review* 60 (1):20–43.

Quine, W. V. O. 1953a, *From a Logical Point of View*, Harvard University Press.

Quine, W. V. O. 1953b, Three Grades of Modal Involvement, *Proceedings of the XIth International Congress of Philosophy* 14:65-81.

Quine, W.V. O. 1960, *Word and Object*, MIT Press.

Rayo, Agustín 2013, *The Construction of Logical Space*, Oxford: Oxford University Press.

Rayo, Agustin 2020, On the open-endedness of logical space, *Philosophers' Imprint* 20.

Raven, Michael 2020, Explaining Essence, *Philosophical Studies* 178 (4):1043-1064.

Romero, Carlos 2019, Modality is Not Explainable by Essence, *Philosophical Quarterly*, 69, pp. 121-41.

Rosen, Gideon 2006, The Limits of Contingency, In Fraser MacBride (ed.), *Identity and Modality*, Oxford University Press, pp. 13-39.

Rosen, Gideon 2010, Metaphysical Dependence: Grounding and Reduction, in *Modality: Metaphysics, Logic, and Epistemology*, ed. B. Hale, A. Hoffmann, New York: Oxford University Press: 109–36.

Rosen, Gideon 2017, Ground by Law, *Philosophical Issues* 27 (1):279-301.

Sapire, David 1991, General Causation, *Synthese* 86 (3):321-347.

Schaffer, Jonathan 2009, On What Grounds What, In David Manley, David J. Chalmers & Ryan Wasserman (eds.), *Metametaphysics: New Essays on the Foundations of Ontology*, Oxford University Press. pp. 347-383

Schaffer, Jonathan 2010, Monism: The Priority of the Whole, Philosophical Review 119 (1):31-76.

Schaffer, Jonathan 2015, What not to Multiply Without Necessity, *Australasian Journal of Philosophy* 93 (4):644-664.

Schaffer, Jonathan 2016a, It is the Business of Laws to Govern, *Dialectica* 70 (4):577-588.

Schaffer, Jonathan 2016b, Grounding in the Image of Causation, *Philosophical Studies* 173 (1):49-100.

Schaffer, Jonathan 2017a, Laws for Metaphysical Explanation, *Royal Institute of Philosophy Supplement* 82:1-22.

Schaffer, Jonathan 2017b, The Ground Between the Gaps, *Philosophers' Imprint* 17.

Schrenk, Markus 2005, *The Bookkeeper and the Lumberjack. Metaphysical vs. Nomological Necessity*, in G. Abel (ed.), *Kreativität. XX. Deutscher Kongress für Philosophie. Sektionsbeiträge Band 1*, Universitätsverlag der Technischen Universität.

Schroeder, Mark 2021, *Reasons First*, New Zork: Oxford University Press.

Schwarz, Wolfgang 2013, Contingent Identity, *Philosophy Compass* 8 (5):486-495.

Shoemaker, Sydney 1980, Causality and Properties, In Peter van Inwagen (ed.), *Time and Cause*. D. Reidel. pp. 109-35.

Sider, Theodore 2003, Reductive Theories of Modality, In Michael J. Loux & Dean W. Zimmerman (eds.), *The Oxford Handbook of Metaphysics*. Oxford University Press. pp. 180-208.

Sider, Theodore 2005, Another Look at Armstrong's Combinatorialism, *Noûs* 39 (4):679–695.

Sider, Theodore 2010, *Logic for Philosophy*, Oxford University Press.

Sider, Theodore 2011, *Writing the Book of The World*, Oxford: Oxford University Press.

Skiles, Alex 2015a, Against Grounding Necessitarianism, *Erkenntnis* 80 (4):717-751.

Skiles, Alex 2015b, Essence in Abundance, Canadian Journal of Philosophy 45 (1):100-112.

Stalnaker, Robert 1968, A Theory of Conditionals, in *Studies in Logical Theory*, Nicholas Rescher (ed.), Oxford: Basil Blackwell, pp. 98-112.

Stang, Nick 2016, *Kant's Modal Metaphysics*, Oxford University Press.

Tooley, Michael 1977, The Nature of Laws, *Canadian Journal of Philosophy* 7 (4):667-98.

van Cleve, James 2018, Brute Necessity, *Philosophy Compass* 13 (9):e12516.

Vetter, Barbara 2015, Potentiality: *From Dispositions to Modality*, Oxford, England and New York, NY, USA: Oxford University Press.

Vetter, Barbara 2021, Essence, Potentiality, and Modality, *Mind* 130 (519):833-861.

Wang, Jennifer 2013, From Combinatorialism to Primitivism, *Australasian Journal of Philosophy* 91 (3):535-554.

Wallner, Michael and Vaidya, Anand 2020, Essence, Explanation, and Modality, *Philosophy. The Journal of the Royal Institute of Philosophy*: 1-27.

Wasserman, Ryan 2017, Vagueness and the Laws of Metaphysics, *Philosophy and Phenomenological Research* 95 (1):66-89.

Wildman, Nathan 2013, Modality, Sparsity, and Essence, *Philosophical Quarterly* 63 (253):760-782.

Wildman, Nathan 2022, Necessity by Accident, *Argumenta* 7 (2):323-335.

Wilsch, Tobias 2015, The Nomological Account of Ground, *Philosophical Studies* 172 (12):3293-3312.

Wilsch, Tobias 2017, Sophisticated Modal Primitivism, Philosophical Issues 27 (1):428-448.

Wilsch, Tobias 2018, Genuine Violations of Laws, *Australasian Journal of Philosophy*, 96(4), 806–821.

Wilsch, Tobias 2021, The governance of laws of nature: guidance and production, *Philosophical Studies* 178 (3):909-933.

Wilson, Alistair 2018, Metaphysical Causation, *Noûs* 52 (4):723-751.

Wilson, Jessica 2014, No Work for a Theory of Grounding, *Inquiry: An Interdisciplinary Journal of Philosophy* 57 (5-6):535-579.

Woodward, James 2003, *Making Things Happen: A Theory of Causal Explanation*, Oxford University Press.