

Haecceities, quiddities, and structure*

Wolfgang Schwarz

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1 Introduction

Most truths can be explained by other, more fundamental truths. That salt dissolves in water, for example, can be explained by the chemical composition of salt and water together with the general laws of physics. Explanations of this kind plausibly come to an end; at some point we reach a bottom level of fundamental facts that are not explainable in terms of anything more basic. Perhaps it is a fundamental fact that a certain negatively charged particle is located at a certain point in space and time. If so, there might still be a *causal explanation* of how the particle got to the relevant place, but there will be no further *metaphysical explanation*, no underlying facts that give rise to the phenomenon that the particle is where it is.

I do not know what kinds of facts are fundamental. David Lewis [1986a] conjectured that the fundamental facts are physical facts concerning the distribution of quantities such as mass, spin, or charge in spacetime. There is an ongoing debate over whether Lewis’s conjecture is compatible with quantum physics (see e.g. [Miller 2014]). It is obviously incompatible with the idea that there are fundamental non-physical properties responsible for the phenomenal character of conscious experience. Let’s assume as a more neutral starting point that the fundamental facts concern the instantiation of fundamental properties and relations by fundamental particulars – leaving open whether these properties and particulars are physical and whether all fundamental relations are relations of spatiotemporal distance.

Imagine a language \mathcal{L} with predicates for all fundamental properties and names for all fundamental particulars.¹ On the present assumption, the world is fully characterized by a long (perhaps infinite) conjunction of atomic sentences in \mathcal{L} : $Fa \wedge Ga \wedge Fb \wedge Rab \wedge \dots$. Let’s call that sentence *the world book*.

Just to be clear: I do not assume that reality has an objective first-order syntactical structure. I don’t even know what that would mean. The world is not a book. It does not have a syntax, any more than it has a phonology. I merely assume that \mathcal{L} has the expressive power to fully capture fundamental reality.

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¹ By saying that \mathcal{L} is a language, I do not mean that it is the language of a possible community; I simply mean that it is a set of well-formed formulae with a certain interpretation.

In fact, the \mathcal{L} -description of the world is in some ways artificial and problematic. For one thing, the world book isn't unique: if the world is characterized by $Fa \wedge Ga \wedge \dots$, then it is also characterized by $Ga \wedge Fa \wedge \dots$: order doesn't matter. More seriously, many candidates for fundamental properties and relations are not on-off properties but quantities that can take a range of values on some scale. Having a mass of 1 gram and having a mass of 2 grams are not separate, independent properties. If mass is the kind of quantity we think it is, then once it is settled that an object has a mass of 1 gram it is no longer an open question whether it also has a mass of 2 grams. In that respect, it is misleading to represent the two properties by simple atomic predicates, F and G . A more perspicuous representation would trade our sentence of predicate logic for a different mathematical structure, perhaps using some kind of state space. That would also help to deal with various edge cases such as emergent fundamental properties instantiated by non-fundamental particulars², temporally enduring fundamental particulars³, fundamental particulars that don't instantiate any qualities⁴, and the hypothesis that reality does not have a fundamental level⁵. For the sake of simplicity, I will mostly ignore these problems in what follows, since they are independent of the issues I want to discuss.

One might also question whether reality is fully characterized by the world book on the grounds that the world book leaves open certain facts. In particular, it might be objected that merely specifying which fundamental properties and relations are instantiated by which fundamental particulars leaves open *nomic* facts about the laws of nature, chance, and causation. If there are fundamental nomic facts, the world book has to be extended. Following [Dretske 1977], [Tooley 1977], and [Armstrong 1983], that could be done by adding a chapter specifying that a second-order relation N of causal necessitation obtains between fundamental properties.

The question on which I want to focus is not whether the world book must be extended, but whether it can be compressed. As it stands, the book contains a name for every fundamental particular. Is that necessary in order to completely describe fundamental reality? If a God had created the world, and she had begun by settling the qualitative

2 \mathcal{L} doesn't have names for non-fundamental particulars, but they might be naturally represented by sets of whatever represents fundamental particulars once we go beyond the syntactic constraints of \mathcal{L} .

3 If a fundamental particular a changes from F to non- F over time, the fundamental description of the world can't simply state whether or not a is F ; it has to state that a is F at t_1 and non- F at t_2 . One could do that by representing F as a relation to times: $F(a, t_1) \wedge \neg F(a, t_2)$. But this seems to imply that the fundamental particulars include times, which may be false.

4 In \mathcal{L} , one can state $\exists x(x = a)$ or $a = a$, but that seems to imply that identity is a metaphysically fundamental relation, which it certainly isn't. (After having specified which fundamental particulars there are and which physical properties and relations they instantiate, God doesn't have to further specify which of the fundamental particulars are identical to one another; it is automatically the case that every particular is identical to itself and to nothing else).

5 [Skyrms 1993] and [Arntzenius 2008] advocate a measure theoretic representation of worlds without a fundamental level.

properties of fundamental particulars, including their relations to other particulars, would there still be an open question concerning the identity of the particulars?

Haecceitism says that there would. According to haecceitism, fundamental particulars have a primitive identity or *haecceity* (a “thisness”) that is not settled by their qualitative properties. A complete characterization of the world therefore has to go beyond merely qualitative facts. By contrast, from an *anti-haecceitist* perspective, the world can be completely characterized without naming any particulars. Our original world book $Fa \wedge Ga \wedge Fb \wedge Rab \wedge \dots$ can be replaced by its first-order ramsification $\exists x_1 \exists x_2 \dots (Fx_1 \wedge Gx_1 \wedge Fx_2 \wedge Rx_1x_2 \dots)$.⁶

Anti-haecceitism does not deny that there are fundamental particulars. The ramsified world book still mentions fundamental particulars, it just doesn’t mention them by name. Thus anti-haecceitism is not the view that one could fully characterize the world by merely going through the list of qualities and specifying which of them are co-instantiated. Consider a world of two-way eternal recurrence. Here any particular a in any epoch has a perfect qualitative duplicate a' in the next epoch. Since a and a' are not identical, not all differences between particulars are qualitative differences. Anti-haecceitism is compatible with this possibility.

A question parallel to the choice between haecceitism and anti-haecceitism arises for fundamental properties and relations. The assumption that the world book must contain specific predicates for all fundamental properties reflects the metaphysical hypothesis of *quidditism*, on which fundamental properties have a primitive identity or *quiddity* (“suchness”) that is not fixed by their place in the total pattern in which fundamental properties and relations are instantiated by fundamental particulars. From an *anti-quidditist* perspective, the world book could be replaced by its second-order ramsification $\exists X_1 \exists X_2 \exists X_3 \dots (X_1a \wedge X_2a \wedge X_1b \wedge X_3ab \dots)$.⁷

If we combine anti-haecceitism with anti-quidditism, we reach a view that might be called *pure structuralism*. On this view, neither fundamental particulars nor fundamental properties need to be explicitly specified in a fundamental description of the world. The fundamental truths can be expressed by a purely logical sentence – a sentence without any non-logical terms: $\exists X_1 \exists X_2 \exists X_3 \dots \exists x_1 \exists x_2 \dots (X_1x_1 \wedge X_2x_2 \wedge X_1x_2 \wedge X_3x_1x_2 \dots)$. According to pure structuralism, all metaphysical explanations bottom out in purely

⁶ Ramsification was invented in [Ramsey 1931]. It is sometimes claimed (e.g. in [Fine 2010]) that existentially quantified truths are always made true by more fundamental non-quantified truths: that *something* is on the table is true because *my cup* is on the table. Anti-haecceitism seems to deny that claim, by postulating fundamental existential truths. However, this merely reveals another shortcoming of using the language of predicate logic to characterize fundamental reality. In a state space representation, we could simply remove degrees of freedom reflecting the identity of particulars.

⁷ If the world book contains a chapter on laws, we might distinguish a *strong* form of anti-quidditism on which the necessitation predicate, too, get ramsified away, and a *weak* form on which it is kept in place. I will return to this matter in section 6.

logical truths.

The idea may seem absurd. On the face of it, it is hard to see how *any* substantive fact about the world could be explained by a purely logical statement. That salt dissolves in water, that tomatoes are red, that Napoleon lost at Waterloo – these seem to depend not only on the abstract structure of the world, but also on how the structure is “filled in”. Nevertheless, I will argue that there are reasons to take pure structuralism seriously. There are reasons to think that all truths, or at least all truths we can ever know, are indeed made true by the abstract structure of the world.

2 Fundamentality and recombination

It will be helpful to think about the present issues in terms of distinctions between possible worlds. We have assumed that the fundamental facts settle all the facts. In possible worlds talk, this means that any world that agrees with the actual world with respect to the fundamental facts also agrees with it about everything else. More generally, any worlds that agree with respect to their fundamental facts agree with respect to all the facts. For suppose two worlds don’t agree about some phenomenon P : at w_1 P is true, at w_2 it is false. Then either this difference between the two worlds is metaphysically basic or it can be explained by other, more fundamental differences. In the first case, it seems to be a fundamental fact at w_1 that P obtains. In the second case, where the obtaining of P at w_1 is explained by more fundamental truths at that world, we can repeat the argument with those more fundamental differences. Unless there are bottomless chains or circles of metaphysical explanation, we will eventually reach a fundamental difference.

So if we set aside the possibility of bottomless chains and circles, every possible world is completely characterized by its fundamental facts. Moreover, the fundamental facts plausibly constitute a *minimal* basis for everything else, insofar as no possible world is completely characterized by a proper subset of its fundamental facts. If some fact P is strictly entailed by some fundamental facts Γ , in the sense that every Γ -world is a P -world, then it looks like God could have stopped her creation after settling the facts in Γ .

If the fundamental facts about the actual world are captured by a world book specifying the distribution of fundamental properties and relations over fundamental particulars, then presumably the fundamental facts of other possible worlds are likewise expressed by a world book of that kind. It is tempting to also endorse the converse: that every world book characterizes a possible world. This amounts to a broadly Tractarian principle of recombination on which every conjunction of atomic \mathcal{L} -sentences completely characterizes some possible world.

The Tractarian principle has well-known problems related to the inadequacies of representing fundamental reality in the language of predicate logic. For example, we

might want to rule out worlds in which some fundamental particular has both a mass of 1 gram and a mass of 2 grams. A better way to state the principle of recombination might use the mathematical structures that more adequately capture the formal aspects of fundamental quantities. To cut the matter short, let's say that a conjunction of atomic \mathcal{L} -sentences is *formally consistent* if it corresponds to one of these structures, meaning that it respects the fact that things can only have one value of mass, that spatiotemporal distance is symmetrical, and so on. The principle of recombination can then be expressed as the claim that every formally consistent world book characterizes a possible world.

The combinatorial account of logical space is generous. It is not just a space for ways the actual world could have been. It allows for worlds that are utterly unlike the actual world from the outset. It allows for worlds that display none of the regularities captured by our laws of physics. It allows for worlds without Gods and (unlike Lewis's modal realism) for "multiverse" worlds consisting of several spatiotemporally disconnected universes.

For some uses of possible worlds, some of these possibilities can be ignored. Ordinary judgements about what could happen, or about what is "really" possible as opposed to epistemically possible, are perhaps best cashed out as judgements about a restricted space of dynamical or "circumstantial" possibilities, constrained by the past, the laws of nature, and certain intrinsic properties of individuals.⁸ On the other hand, for some of the more theoretical uses of possible worlds in metaphysics, confirmation theory, decision theory or semantics, a larger combinatorial space proves useful.

In particular, it proves useful for thinking about what must be included in the fundamental description of reality. To illustrate, suppose we only allow for dynamically possible worlds, holding fixed the initial conditions of the universe. To pick out the actual world from among all possible worlds, the initial conditions then needn't be mentioned. Nonetheless, some facts about the initial conditions are plausibly fundamental. A complete description of fundamental reality should not fall silent on them. If God had to create the world, she had to say something about the initial conditions. In general, our assumption that the fundamental facts provide a minimal entailment basis for all facts suggests that whenever P is a fundamental fact at some world then there is another world at which P is false. So we have use for a space of metaphysically possible worlds that goes beyond dynamical possibilities for the actual world.

The combinatorial account also suggests a simple metaphysics of possible worlds. If

⁸ To say that modal judgements can be cashed out as judgements about a space of worlds is not to say that the relevant modal facts are ultimately explained by or made true by facts about possible worlds. The latter claim strikes me as rather implausible, and it is not assumed by classical possible-worlds accounts – *pace* recent claims among "new actualists" (see [Vetter 2011]). For example, a central doctrine of Lewis's metaphysics was that truths about dispositions, counterfactuals, abilities and the like are made true by local, non-modal facts about the actual world. Lewis used possible worlds to model the *content* of these truths, but the worlds were not put forward as metaphysical grounds.

every world is characterized by a world book and every world book characterizes a world, why not interpret talk about possible worlds in terms of world books (or the more adequate mathematical structures for which our world books go proxy)? The idea is developed in [Skyrms 1981], [Lewis 1986b], [Armstrong 1989], [Heller 1998], [Sider 2002], and elsewhere. Since the metaphysics of possible worlds is not my present focus, I will not recap the whole discussion, except to mention one issue that is often regarded as the most serious problem for the combinatorial approach. The problem is that not all (broadly) possible worlds can be reached by recombination of actual particulars and properties. We need world books that talk about *alien particulars* and *alien properties*, but how can we interpret the relevant names and predicates in \mathcal{L} without presupposing an independently given space of possibility?

I mention this problem because it disappears if we accept pure structuralism, the conjunction of anti-haecceitism and anti-quidditism. In possible worlds talk, anti-haecceitism can be formulated as the thesis that no two worlds differ just in the identity of particulars, without also differing in some qualitative respects (compare [Lewis 1986b: 220–227]). Just as the actual world is completely described by a first-order Ramsey sentence $\exists x_1 \exists x_2 \dots (Fx_1 \wedge Gx_1 \wedge Fx_2 \wedge Rx_1x_2 \dots)$, every formally consistent Ramsey sentence of that type describes a possible world. Worlds with alien particulars are therefore represented by world books according to which, for example, there are more things than there are in the actual world. We don't need names for those particulars.

Anti-quidditism similarly dissolves the problem of alien properties. Pure structuralism therefore has no problem with aliens. According to pure structuralism, no two worlds differ merely in the identity of fundamental particulars or fundamental properties without also differing in structure. To be more precise, let's say that two worlds are *structurally identical* if there is an isomorphism I between their fundamental particulars and properties that preserves instantiation, so that x instantiates y in w_1 iff $I(x)$ instantiates $I(y)$ in w_2 .⁹ Pure structuralism can then be expressed as the hypothesis that structurally identical worlds agree about everything.

It would be convenient for an actualist metaphysics of possible worlds if pure structuralism were true, but that is hardly a convincing reason to believe it. Let me turn to some better reasons.

3 Anti-haecceitism

Anti-haecceitism says that the fundamental truths about the world can be expressed without naming any particulars. As Lewis put it, “all contingent truth supervenes just

⁹ In addition, the isomorphism should plausibly preserve formal aspects of the relevant properties and relations such as symmetry or transitivity.

on the pattern of coinstantiation [of fundamental properties and relations], never mind which particular hooks the properties and relations are hanging on” [1994: 255].

The hypothesis has some intuitive support. Imagine God began her creation by settling all the qualitative facts. Among other things, she would thereby have settled that at a certain time in a certain region of the universe, a planet with such-and-such features is surrounding a sun at such-and-such distance, that the planet is populated by organisms of various kinds, some of which refer to it as ‘Earth’, and so on. Would she have had to go on and specify that the planet in question is indeed Earth, rather than Jupiter or some alien planet that doesn’t exist at all in our universe? Arguably not. Recall that anti-haecceitism does not deny that there are objects, or that they can be named. Since we have named our planet ‘Earth’, anti-haecceitism can readily agree that ‘we live on Earth’ is true. Moreover, it is true no matter what haecceity, if any, was bestowed on our planet. It is hard to see what other truths would require that the earth has a particular haecceity.

Now the earth is not a fundamental particular, but the case for haecceitism doesn’t look any better when we consider spacetime points or other candidates for fundamental particulars. If any thing, it looks worse. Once God has settled that there is a spacetime manifold with such-and-such topological features wherein such-and-such quantities are distributed in such-and-such ways, would she have to go on and give each spacetime point a haecceity? What truths would turn on that choice?

On the other hand, there also seems to be an intuitive argument in support of haecceitism. As Saul Kripke emphasized in [Kripke 1980], when we think and talk about counterfactual scenarios, we often pick them out by modifying or rearranging actual objects: we consider scenarios in which *this table* is further to the left, in which *my cup* is red, or in which *Hubert Humphrey* won the election. The scenarios we have in mind here seem to be characterized not just by a distribution of qualities, but also by the identity of certain individuals. Indeed, we can arguably distinguish counterfactual scenarios that completely agree in the distribution of qualities but differ in the identity of individuals. For example, my cup could have existed all on its own, and so could some other, intrinsically identical cup. These seem to be distinct possibilities, even though they agree in the distribution of qualities.

However, on reflection these intuitions lend little support to haecceitism. To begin, anti-haecceitism is perfectly compatible with the assumption that tables, cups, or presidential candidates exist at other possible worlds, and that we can pick out possible scenarios with reference to specific tables and planets. Anti-haecceitism merely denies that there are fundamental truths concerning the identity of tables, cups, or anything else: if it is true at some world that my cup is red, then this must be made true by more fundamental facts not involving the cup. But that much is hard to deny. Surely there are no fundamental truths about cups or tables or Hubert Humphrey. Even haecceitists should agree that

truths about cups are made true by more fundamental facts.

There is a genuine puzzle here, but it is equally a puzzle for haecceitists and anti-haecceitists. Suppose it is true at some world w that my cup is red. We can factor that hypothesis – that my cup is red – into two parts: (1) there is a cup with certain qualitative features; (2) the cup in question is identical to the cup that is standing here on my table in the actual world. By assumption, both of these are true at w . But if (2) is true at w , what makes it true? It can't be a fundamental fact if w is anything like the actual world, where there are no fundamental facts about cups. Indeed, let's assume that w is a world of classical physics where the fundamental objects are spacetime points. Haecceitism would allow that (2) can be metaphysically explained by facts about the identity of the spacetime points in w . But how would that explanation go? Can't we imagine scenarios that differ in the identity of the cup although they contain the very same spacetime points? The intuitions that seem to support haecceitism thus seem to support not just haecceitism, but *metaphysical anarchism* – the view that there are metaphysically fundamental facts about tables, cups, and presidential candidates.

In response, one might suggest that we should distinguish our space of metaphysically possible worlds from the space of *counterfactual scenarios*. Counterfactual scenarios are usually characterized from the perspective of the actual world, with reference to actual individuals. By contrast, God could hardly have created the world by modifying and rearranging actual individuals – those individuals first had to be created. The intuitions in support of haecceitism suggest that counterfactual scenarios are only fully specified if the identity of tables, cups, and presidential candidates is fixed. It does not follow that there are fundamental facts concerning the identity of these objects.

I think this idea is on the right track, but it doesn't fully resolve the present puzzle. After all, the assumption that all facts are made true by fundamental facts is plausible not just as a claim about the actual world, but also under counterfactual suppositions. If my cup had been red, all facts would still have been made true by fundamental facts. Moreover, there would still not have been any fundamental facts about cups. But then what makes it true, in the relevant counterfactual scenarios, that my cup is red?

A promising answer is to say that truths that depend on the identification of cups in counterfactual scenarios aren't the kinds of truth that are made true by fundamental truths in the relevant world. Not because they are mysterious extra truths that are neither fundamental nor made true by fundamental truths, but because they aren't intrinsic truths about the world at all. By analogy, consider a possible scenario w in which some planet is larger than any actual planet. This fact about w is partly made true by facts about the size of planets in w , but partly by facts about the size of planets in the actual world. Similarly, we can say that 'my cup is red' is true in a counterfactual scenario partly in virtue of the fact that there is a certain kind of red cup in that scenario and partly in virtue of the fact that this cup qualifies as a possibility for a certain cup in

the actual world, which is not an intrinsic fact about the counterfactual scenario.

The picture might be fleshed out as follows, loosely drawing on [Lewis 1986b: ch.4]. Assume, in line with anti-haecceitism, that every possible world is fundamentally characterized by a first-order ramified world book. These world books implicitly represent the existence of various cups and tables and spacetime points, but they do not identify these objects with objects in other possible worlds. They also don't represent them as distinct from objects in other worlds. World books are silent on questions of trans-world identity. Now any object at any world can be taken to represent a maximally specific qualitative *way a thing might be* – namely to be just as that object is in that world. For example, a red cup in an otherwise empty universe represents the possibility of being a red cup (of a particular kind) in an otherwise empty universe. The statement that my cup could have been red can then be analyzed as saying that some red thing at some possible world represents a maximally specific way my cup could have been. Let's say that my cup could indeed have been red, and that it could have been a red cup in an otherwise empty universe. (The status and grounds of such facts is a matter we can here set aside.) Then the lonely red cup in the relevant possible world represents a possibility for my cup: a maximally specific way my cup could have been. So there is a deep connection between counterfactual scenarios and metaphysically possible worlds. When we consider a counterfactual scenario in which my cup is lonely and red, we consider a possible world that is intrinsically neutral on the identity of the lonely cup, but we consider it as a possibility for my cup.

Without going into further details, we might conclude that haecceitism isn't needed to account for the way we usually think about counterfactual scenarios. Admittedly, the account just outlined is less straightforward than one might have expected. However, it reconciles the intuitions for and against haecceitism, it avoids metaphysical anarchism, it preserves the unity of logical space, and it turns out to solve a number of further puzzles associated with our counterfactual judgements, including their context-sensitivity and vagueness and their tolerance for contingent identity and distinctness (see [Schwarz 2013]).

4 Haecceitistic humility

Let's set aside the arguments in the previous section and assume that haecceitism is true: there are qualitatively identical possible worlds that differ merely in the identity of fundamental particulars. Could we ever come to know which of these possibilities is actual? More generally, if two possibilities differ merely in the identity of particulars, can we gain evidence that supports one over the other? Is it ever rational to assign them different credence? Let *haecceitistic humility* be the hypothesis that the answer is no.

Haecceitistic humility is strictly weaker than anti-haecceitism. If no two worlds differ

merely with respect to haecceities, then *a fortiori* we can never have evidence that favours one over the other, nor could we rationally assign them different degrees of belief. So the arguments for anti-haecceitism in the previous section are automatically also arguments for haecceitistic humility. As we will see, the case for haecceitistic humility is significantly stronger.

Suppose for concreteness that my cup has a primitive haecceity. Consider two worlds w_1 and w_2 that are qualitatively just like the actual world but that differ with respect to the identity of my cup. Call the cup in w_1 *Alpha* and the cup in w_2 *Beta*.

The two scenarios seem a priori on a par. There is nothing intrinsically implausible or deviant about w_1 as opposed to w_2 , or about w_2 as opposed to w_1 . On the contrary, since the only difference between the two scenarios concerns the haecceity of a certain cup, they plausibly deserve equal a priori credence. Do we have evidence that favours one over the other, or could we get such evidence? Arguably not. By hypothesis, Alpha in w_1 looks exactly like Beta in w_2 . The two cups in their respective worlds have the exact same shape, the same colour, the same stains, the same chemical composition; they occupy the same place on the table, and so on. It would therefore be pointless to investigate the cup on my table in order to determine whether it is Alpha in w_1 or Beta in w_2 .¹⁰

The argument generalizes to other individuals. There might be worlds that differ only in the identity of spacetime points, but it is hard to see how we could gain evidence concerning which of them is actual. In general, if there are fundamental facts about haecceities, it looks like we can never know them, nor can we have rational beliefs one way or the other.

Haecceitists sometimes hold that in order to have rational beliefs concerning a given haecceity, one must have causal contact with the relevant individual. This suggests that if w_1 is the actual world, then we can't assign any credence at all to hypotheses concerning Beta; worlds like w_2 are not even candidate objects of credence; they don't need to be ruled out because they were never "in". However, we can assume that Alpha and Beta both exist in either world: in w_1 , Alpha is the cup on the table while Beta is on the shelf, in w_2 it is the other way round. Now I am in causal contact with both Alpha and Beta, but no evidence could ever tell me which is which – whether I'm in w_1 or w_2 . In any case, if it were true that the worlds over which our credences are defined never differ merely in the distribution of haecceities, then haecceitistic humility would come out as essentially true: no two candidates for reality would differ just with respect to haecceities; purely qualitative information about the world would suffice to settle everything we can ever know.

¹⁰ Note also that the two scenarios exactly agree with respect to the physical excitation of our sensory receptors. Whatever we do, the photoreceptors in our eyes, the touch receptors in our skin, etc. are excited in the exact same in w_1 and in w_2 .

The force of haecceitistic humility is easy to miss if we focus on ordinary-language attitude reports. Consider the following recipe for coming to know the haecceity of my cup. First, let's give the cup a name; we'll call it 'Carl'. Observe that any world in which Carl has been replaced by some other, qualitatively indistinguishable cup is not a world in which Carl is on the table. But I know that Carl is on the table. So I can rule out all worlds in which Carl has been replaced by some other cup.

If that argument were sound, it would show that we can acquire substantive knowledge about the world not just by collecting empirical evidence, but also by acts of linguistic stipulation. The recipe works not only for haecceitistic knowledge. For example, I don't know in what year Julius Caesar was born. But let's call that year, whichever it is, 'year X '. Now I do know that Caesar was born in year X . So it looks like I can rule out all worlds in which Caesar was not born in year X – the year in which he was actually born. I have come to know Caesar's year of birth, merely by making a linguistic stipulation.

Have I really come to know Caesar's year of birth? I want to remain neutral on this question. Perhaps I have come to know it "under one guise" but not under another. What's important is that there is a clear sense in which the linguistic stipulation sheds no light whatsoever on when Caesar was born. If I initially assigned credence 0.5 to worlds in which Caesar was born before 100 B.C., then I should still assign credence 0.5 to these worlds after introducing the name 'year X '.

The lesson here is that we must not draw hasty conclusions from ordinary-language knowledge reports. I do know that Caesar was born in year X . Moreover, worlds in which Caesar was born in some other year are not worlds where he was born in year X . Yet my rational credence is spread over a whole range of worlds that differ in Caesar's year of birth. None of them is ruled out by my evidence. So the following principle must be rejected:

- (*) If S knows that p , and p is false at world w , then S 's knowledge (or evidence, or credence) excludes w .

Thus when I ask whether our knowledge excludes a possible world w , I do *not* mean whether we know some p such that p is false at w .¹¹ In other words, I assume that there

¹¹ At least not on the standard way of evaluating whether something is true or false at a world. Perhaps there is another way of evaluating sentences or propositions at worlds that would render (*) more plausible. Consider again the statement that Caesar was born in year X . Since 'year X ' was defined to pick out whatever year Caesar was born in, saying that Caesar was born in year X intuitively doesn't convey any information about Caesar's year of birth. In that sense, the truth of the statement doesn't rule out any worlds in which Caesar was born at all. (Similarly, that Carl is on the table does not convey any real information about the identity of my cup.) Explaining the two ways of evaluating a statement at a world would lead us down the rabbit hole of "two-dimensional semantics". I won't descend into these grounds, since I think (*) would have to be rejected even if we interpret truth at a world in a non-standard way.

is a kind of knowledge, belief, and evidence whose content can be modelled in terms of possible worlds but that can't be simply read off from ordinary-language attitude reports. We can ask directly about a given possible world whether it is compatible with an agent's total evidence, knowledge or belief. The above discussion of w_1 and w_2 illustrate the point. I said that both possibilities deserve about equal a priori credence, and that our evidence doesn't favour one over the other. These claims are – I hope! – intelligible, although they do not proceed via ordinary attitude reports.

This is not the place for a detailed explanation and defence of the possible-worlds conception of knowledge, belief, and evidence. The conception has proved useful in formal epistemology, in confirmation theory, and in decision theory. It captures the intuition that to acquire information about the world is to rule out alternative ways the world might have been. The framework has well-known limitations, especially when it comes to modelling a priori knowledge and reasoning, but I will continue on the assumption that it is adequate to model an important kind of empirical knowledge.

5 Anti-quidditism

Anti-quidditism is the view that all truths are made true by fundamental truths that do not identify individual properties or relations. That electrons have mass, for example, would be explained by the fact that they have a property that plays the characteristic role of mass. Figuratively speaking, once God has settled that some fundamental quantity M behaves just like mass – so that, for example, two objects attract one another with a force proportional to the product of their M values – she would not have to go on to settle that M is indeed mass rather than charge or spin or some alien quantity not known to our physics.

Like anti-haecceitism, anti-quidditism has some intuitive appeal. Our term 'mass' plausibly denotes whatever quantity plays the mass role. As long as there is a quantity that plays the role, and electrons have that quantity, we can truly say that electrons have mass. It doesn't seem to matter whether mass has a quiddity, and if so which. But if the fact that electrons have mass doesn't turn on the distribution of quiddities, then it is hard to see for what other truths quiddities might be relevant.

Unfortunately, the debate over quidditism tends to become entangled with the debate over Humeanism – whether facts about laws, dispositions, counterfactuals and the like are reducible to non-nomic, “categorical” facts. For example, consider the following argument in support of quidditism. Intuitively, God could have chosen to create a small world consisting of a single particle with positive mass. She could also have created a world in which the particle instead has some other fundamental property. These are distinct possibilities, but they seem to differ merely in the assignment of quiddities. In

particular, the two worlds have the same second-order ramsified world book – something like $\exists X Xa$.

This is a powerful argument, but it is an argument against quidditism only in conjunction with Humeanism. Quidditism allows that the (ramsified) world book should include a chapter on nomic truths. That chapter would plausibly reveal a difference between the two worlds. For example, the particle with mass is disposed to attract an intrinsic duplicate, the particle without mass is not. The Humean claim that such nomic facts are reducible to regularities in the history of categorical events is especially implausible for small worlds – which is why the present line of argument is well-known in the debate on Humeanism (see e.g. [Lange 2000: 48–51]).

To disentangle anti-quidditism from Humeanism, we should understand quidditism as the view that there are facts about the identity of fundamental properties that are left open by their pattern of instantiation and their nomic roles, bracketing the question whether the latter are reducible to the former. To illustrate this usage, consider the view that fundamental physical properties have their nomic role essentially, so that a particle can only have mass if it has the corresponding dispositions. Whether that counts as quidditism now depends on whether different fundamental properties can have the exact same nomic role. Suppose not. The world could then be completely described by a second-order ramsified world book that includes a chapter on nomic roles. Once it is settled that a quantity plays the mass role, God would not have to settle any further facts concerning the identity of the property. The position therefore does not count as a form of quidditism in the present sense.

Now return to the intuitive difference between the massive and the massless particle. To provide a genuine test for quidditism, we have to assume that there is an isomorphism between the two worlds not just with respect to the instantiation of fundamental properties by particulars, but also with respect to the properties' nomic profile. If Humeanism is true, the latter isomorphism is entailed by the former; if anti-Humeanism is true, it puts further constraints on the two worlds. Either way, we can ask whether these constraints are enough to make the worlds agree in every respect. So we have to assume that the particle has the same dispositions in the two worlds, that the property it instantiates is involved in the same laws, etc. The intuition that the worlds are genuinely different thereby loses a lot of its force. If a particle instantiates a property that has all the characteristic features of mass, is there still an open question about the identity of that property?

As in the case of haecceitism, it must be acknowledged that quidditism better fits the way we commonly think and talk about counterfactual possibilities, namely by rearranging actual objects and properties. But again, on reflection it is not clear that these judgements about counterfactual scenarios really support quidditism. The dialectical situation looks a lot like that in section 3, so I will not go through all the same hoops again. The outcome

is that our counterfactual judgements can be given an anti-quidditist explanation on which a quantity in a counterfactual scenario counts as mass partly in virtue of the role it plays at that world and partly because we take it to represent a way the quantity that actually plays the mass role could have been. The account is more complicated than a straightforward quidditist account on which actual properties and relations are fundamental building blocks of other possible worlds, but (1) a credible quidditist account would also have to look more complicated when we turn to non-fundamental properties that aren't fundamental building blocks of any world, (2) the anti-quidditist account promises to respect both intuitions for and against quidditism, and (3) it accounts for further phenomena such as the vagueness and context-sensitivity in our essentialist judgements concerning physical properties.

Let me now turn from quidditism to *quidditistic humility*. Assuming that worlds can differ just in the identity of fundamental properties, can we distinguish between these possibilities in our knowledge or belief? Could we ever find out whether the properties we know as mass or charge have one quiddity rather than another? It is sometimes taken for granted that the answer is no (e.g. in [Black 2000]). Lewis gives an argument for that conclusion in [Lewis 2009], but the argument is hard to follow and seems to rest on rather strong (one might say question-begging) premises.¹²

That said, one can argue for quidditistic humility along the same lines as I argued for haecceitistic humility in section 4. Let w_1 and w_2 be two worlds that differ merely in the identity of the quantity that plays the charge role. Let's call the two quantities C_1 and C_2 , respectively. Assuming quidditism about charge, w_1 and w_2 are different possible worlds. Moreover, given the symmetries between the two, it would be odd if one of them could be ruled out a priori. If we can reasonably assign higher credence to w_1 than w_2 , that must be because we have received evidence, presumably through our senses, that favours the one possibility over the other. But what could such evidence be? Particles with a given C_2 value in w_2 behave just like particles with the corresponding C_1 value in w_1 . If an object with positive C_1 value is put in an electroscope in w_1 , and thus an object with positive C_2 value is put in an electroscope in w_2 , the electroscopes move in exactly the same way. So the movement of the electroscope sheds no light on whether we're in w_1 or w_2 . Similarly for other tests and other fundamental properties. We can find out that an object has (inertial) mass by observing its resistance to acceleration. But that does not help to distinguish between worlds in which different fundamental properties underlie an object's resistance to acceleration.

¹² See [Leuenberger 2010] for a critical discussion of Lewis's argument. The most question-begging premise is that all observations can be expressed in a language that cannot distinguish between worlds that differ only with respect to quiddities. (Note that what Lewis calls 'Humility' is the conjunction of quidditism with what I call quidditistic humility. If quidditism is false, quidditistic humility is true whereas Lewis's 'Humility' is false.)

There might be exceptions. Some hold that the phenomenal character of conscious experience is fundamental. Suppose that is true. Suppose also that there are worlds where the phenomenal character of (say) red experiences has traded places with some other fundamental property – say, positive unit charge. In those worlds we have no phenomenal red experience when looking at tomatoes, and so our experience arguably allows us to rule them out.

However, each step here could be questioned. First and most obviously, it is controversial whether there are fundamental phenomenal properties. Second, if we accept that there are fundamental phenomenal properties, we should arguably reconsider the quidditist/combinatorial assumption that these properties are independent of their causal role. Could phenomenal red really trade places with positive unit charge? Would that mean that positrons have phenomenal red experiences? Is that a coherent way things could have been? Note that if phenomenal red could not have traded places with any other fundamental property, then quidditistic humility is automatically true with respect to phenomenal red – no matter how “acquainted” we are with that property – for our evidence then can’t distinguish between worlds that differ merely by swapping phenomenal red for another fundamental property. Third, even if there are worlds where phenomenal red has traded places with positive unit charge, it is not obvious that this would make any difference to our rational credence. After all, if physicalism is true and there are worlds where charge is replaced by schmarge then colour experiences also involve different physical properties depending on which of these is actual, since charge plays an important role in the biology of perception. But it does not follow – in fact, it is quite implausible – that this difference would make any difference to our rational credence. Arguably, our credence is sensitive only to the causal-functional role of our experiential states, not to the details of their physical or non-physical realization.

In any case, I want to set aside possible exceptions from phenomenal character. Metaphysical primitivism about consciousness might offer an answer to the puzzle I want to discuss – the puzzle that all our knowledge seems to concern the abstract structure of the world – but the answer does not strike me as very attractive. Consider agents in a purely physical world where there are no fundamental phenomenal properties. Intuitively, such agents can still acquire substantive information about their world, but they can’t rely on the help of phenomenal exceptions.

One might argue that while we can’t directly detect the presence of mass or charge by their quiddities, we can detect the presence of more familiar structural properties that involve these quantities. Suppose a substance is water only if it contains oxygen, something is oxygen only if it has electrons, and something is an electron only if it has negative charge. A world in which charge is replaced by schmarge is then a world without water. And surely, one might think, we can detect the presence of water. But can we really distinguish between the relevant alternatives? In the alternative scenario, the

substance we know as ‘water’ behaves in every respect just as water behaves in the actual world. No amount of chemical or physical analysis could reveal to us that it involves one quiddity rather than another.

As above, it is important here not to assume a simplistic connection like (*) between propositional attitude reports and epistemic possibility. Quidditistic humility, either with or without quidditism, is not the skeptical hypothesis that we don’t know whether there is water or whether electrons have negative charge. The view provides no reason to doubt that there are fundamental properties or that they can be named. Our term ‘negative unit charge’ plausibly denotes a property instantiated by electrons. So when we say that electrons have negative unit charge, we say something true, and not just by accident. We *know* that electrons have negative unit charge – despite the fact that our evidence does not rule out worlds in which electrons don’t have negative unit charge.¹³

6 Pure structuralism

Anti-haecceitism and anti-quidditism combined lead to the curious view that all distinctions between possible worlds can be traced to distinctions concerning the structure in which fundamental properties are instantiated by fundamental particulars: any structurally identical worlds (in the sense of section 2) agree about everything; all truths are ultimately explained by purely logical or structural truths. In fact, according to pure structuralism, all truths are *equivalent* to purely structural truths. For if every world is fully characterized by a logical statement, then every set of worlds corresponds to a (possibly infinite) disjunction of logical sentences, which is itself a logical statement. So every truth is truth-conditionally equivalent to a purely logical or structural truth.¹⁴

Haecceitistic and quidditistic humility together lead to an analogous view about epistemic possibility that we might call (*pure*) *epistemic structuralism*. On that view, the only distinctions our evidence, knowledge, or rational belief can draw between possible worlds concern the abstract structure of the world. Whenever two worlds are structurally identical, they are on a par with respect to our evidence and rational credence. All we can

¹³ [Leuenberger 2010] offers some purported counterexamples to quidditistic humility that seem not sufficiently sensitive to the present point. For example, Leuenberger argues that we know that there are material objects, which is false in worlds where the fundamental physical properties of our world have been replaced by alien, non-physical properties. That may be correct, but it doesn’t follow that our evidence allows us to distinguish the actual world from its non-physical counterpart. (Note that in that world, the properties we call ‘non-physical’ are called ‘physical’ and vice versa.)

¹⁴ The distinction between ‘logical’ and ‘structural’ here alludes to the fact that reality may not be adequately captured in the language \mathcal{L} of predicate logic. A more adequate representation might reveal slightly more than a doubly ramified, purely logical \mathcal{L} -statement. For example, it might reveal that a certain relation is symmetrical, or that a certain family of properties are values of a single quantity. Such information may not count as strictly logical, but it is still *structural*.

ever know about the world is settled by the structure of the world. All *knowable* truths are truth-conditionally equivalent to purely structural truths.

Structuralism is easier to swallow in more moderate forms. For example, one might hold that while a complete description of fundamental reality would not need to identify mass or charge or spin, it could not fall silent on the identity of all these properties at the same time. A minimal characterization of the world would have to name at least a few fundamental properties, although it might be somewhat arbitrary which. There might also be specific properties or relations that have to be identified in any complete description of fundamental reality. [Heller 1998] and [Black 2000] for example defend the view that every possible world is fundamentally given by the structure in which fundamental properties are distributed in spacetime. The fundamental \mathcal{L} -description would therefore quantify over all properties except relations of spatiotemporal distance. We might call this restricted form of structuralism *spacetime structuralism*.

But why should spatiotemporal distance deserve a special treatment? For one thing, it is an open question whether spatiotemporal distance is physically fundamental (see [Seiberg 2006]). If not, it arguably shouldn't be mentioned at all in the fundamental description of the world – let alone in the fundamental description of every possible world. More importantly, if we don't allow for worlds in which mass has traded place with another fundamental quantity, do we really want to allow for worlds in which spatiotemporal distance has traded places with something else? If there are no such worlds, then spatiotemporal distance, too, is uniquely characterized by its structural features. So there are reasons to move from spacetime structuralism to pure structuralism.

Incidentally, we can see here the beginnings of an answer to the question how all facts could be ultimately explained by purely structural facts. Let's grant that all facts can be metaphysically explained by what is expressed in the original, unramified world book. Let's also assume that the unramified world book specifies the distribution of mass, charge, spin, etc. over spacetime points, as well as relations of spatiotemporal distance between these points. According to spacetime structuralism, the fact that, say, a certain quantity of mass is located at a certain point can be further explained by the fact that the point instantiates a quantity whose global pattern of instantiation in spacetime displays the characteristic features of mass. (For example, if mass is instantiated at two spatially nearby points at some time, then *ceteris paribus* it is instantiated at even nearer points at slightly later times.) There is nothing more to having mass, so the idea, than to have a property with those features. Similarly for other fundamental properties. Pure structuralism now simply extends that story to spatiotemporal distance: the fact that two points are separated by a certain spatiotemporal distance is explained by the fact that they are linked by a fundamental relation that displays the characteristic structural features of spatiotemporal distance (what physicists call 'spacetime interval').

[Hawthorne 2001] discusses another restricted form of structuralism, *causal structural-*

ism. The view presupposes that the world book includes a chapter on laws, so that the unramified world book looks something like this: $Fa \wedge Fb \wedge Ga \wedge Rab \wedge \dots \wedge N(F, G) \wedge \dots$. Assuming haecceitism, we can ramsify away the individual constants: $\exists x_1 \exists x_2 \dots (Fx_1 \wedge Fx_2 \wedge Gx_1 \wedge Rx_1x_2 \wedge \dots \wedge N(F, G) \wedge \dots)$. Causal structuralism now holds that we can also ramsify away the predicates, as long as we keep the second-order predicate for causal necessitation: $\exists X_1 \exists X_2 \exists X_3 \dots \exists x_1 \exists x_2 \dots (X_1x_1 \wedge X_2x_2 \wedge X_1x_1 \wedge X_3x_1x_2 \wedge \dots \wedge N(X_1, X_2) \wedge \dots)$. The resulting almost purely logical sentence tells us that there are properties X_1, X_2, X_3, \dots that display such-and-such nomic connections to one another and that are instantiated in such-and-such a pattern by fundamental particulars. The idea is that the nomic connections are enough to individuate the fundamental properties.

Again, there is pressure to move from causal structuralism to pure structuralism. For one thing, there are well-known Humean reasons to doubt that there is a fundamental relation of causal necessitation (see e.g. [Schaffer 2008]). Moreover, do we really want to allow for worlds in which causal necessitation has traded places with some other second-order relation? If there are no such world, causal necessitation, too, can be ramsified away.

Causal structuralism suggests another method for recovering facts about mass and charge and spin from a purely structural description of the world. This time we would start by recovering the nomic structure of the world: the nomic connections between X_1, X_2, X_3 , etc. On Humean accounts, these connections are implicit in the fully ramsified worldbook. On anti-Humean account, primitive law facts or necessitation relations can arguably be identified by their structural features. Once the nomic structure is fixed, we could then follow the path of causal structuralism and identify mass, charge, spin, and spatiotemporal distance by their nomic roles.

Pure structuralism is often thought to be refuted by “Newman’s problem” – the fact that purely logical statements can only constrain the number of individuals in the world. Recall that a standard model of second-order logic consists of a set D together with an interpretation function mapping individual constants to members of D and predicates to subsets of D ; first-order quantifiers range over members of D , second-order quantifiers over subsets of D . If a sentence contains no individual constants or predicates, the interpretation function does no work, and it is easy to see that all that matters to the truth-value of the sentence is the cardinality of D . But surely not all truths are made true by the total number of individuals in the world.

Pure structuralism does not run into this problem because the “standard” semantics of second-order logic is clearly not an adequate semantics for \mathcal{L} . To begin, the \mathcal{L} -sentence Fa attributes to some particular a some fundamental property F ; it does not state that a is a member of some set. Otherwise it would be puzzling how Fa could be true at some worlds and not at others: if ‘ F ’ simply picks out, say, the set $\{a, b, c, f, h, k\}$, how can it be contingent whether a is a member of F ? An adequate semantics of \mathcal{L} should interpret

the predicates as expressing qualities, not set membership. Newman’s problem would still arise if the second-order quantifiers were to range over arbitrary gerrymandered properties, including *being a member of* $\{a, b, c, f, h, k\}$. But who decided that that’s the correct interpretation of \mathcal{L} ? Compare the parallel question about first-order quantifiers: does the \mathcal{L} -sentence $\exists xFx$ quantify only over fundamental particulars or also over tables, cups, gerrymandered mereological fusions, sets, and merely possible objects? It is controversial whether there even is a set (or class, or plurality) of absolutely everything (see [Rayo and Uzquiano 2006]); even if there is, there is no obvious reason why the quantifiers in \mathcal{L} must range over that set. The general point here is that even a purely logical language needs to be interpreted, by specifying a domain for its first-order and second-order quantifiers. The only sensible choice for \mathcal{L} is that the first-order quantifiers range over fundamental particulars and the second-order quantifiers over fundamental qualities. Newman’s problem then disappears. A world given by $\exists X\exists Y\exists x\exists y(Xx \wedge Yy)$ is different from a world given by $\exists X\exists Y\exists x\exists y(Xx \wedge Yx \wedge Yy)$, although the two worlds have the same number of fundamental particulars.¹⁵

Newman’s problem is often discussed in the context of what Lewis [1984] calls “global descriptivism”. Global descriptivism is the hypothesis that the meaning of all our words (with the exception of logical words) is determined by their place in our total theory of the world. That is, if our total theory says that *tomatoes are red*, *London is overcrowded*, and so on, then one can simultaneously define ‘tomato’, ‘red’, ‘London’, ‘overcrowded’ etc. by their place in the theory. Our total theory comes out as analytically equivalent to its full ramsification $\exists X_1\exists X_2\ldots\exists x_1\exists x_2\ldots(X_1x_1 \wedge X_2x_1\ldots)$. Note that if we assume that the second-order quantifiers here range over fundamental properties, we get something like the view Lewis defends in [Lewis 1984]. But that view should not be confused with pure structuralism. The kind of structuralism that is our present topic is not a thesis about how words get their meaning; it is not a thesis about language at all. The \mathcal{L} -sentence that can be replaced by its ramsification according to pure structuralism is not our total theory; it does not quantify over tomatoes and London; it is not constrained by what we think or know; it is not a sentence in our language and best understood not as a linguistic construction at all.¹⁶

¹⁵ Again, the point would be even more perspicuous if we used a state space representation instead of sentences in \mathcal{L} .

¹⁶ A thesis somewhere in between global descriptivism and pure structuralism is discussed in [Chalmers 2012] and possibly [Carnap 1928]. The relevant thesis here is that all true sentences are a priori or analytically entailed by a sentence describing just the fundamental structure of the world. The claim is evidently distinct from our version of structuralism, which is not a thesis about a priori entailment between sentences. However, it is loosely related to *epistemic* structuralism, which entails that purely structural information in principle suffices to know everything that is knowable at all.

7 Autonomy for epistemic space?

I have tried to argue that pure structuralism is not as absurd as it may at first appear. Nevertheless, it remains a striking claim – too striking perhaps to be credible. There is an easy way to avoid it: accept haecceitism or quidditism. The arguments I gave against these views in sections 3 and 5 were by no means conclusive. They largely consisted in appeals to intuition and responses to arguments that might have been taken to support haecceitism and quidditism. The implausibility of pure structuralism might be considered a weighty counter-argument, a reason for allowing quiddities and haecceities in one’s metaphysics.

The real trouble-maker is epistemic structuralism. The arguments in section 4 and 5 do make a strong case that even if there are quiddities or haecceities, our evidence and rational belief can never distinguish between worlds that differ merely in those respects. If epistemic structuralism is false, I would like to know where these arguments go wrong. But epistemic structuralism – which David Lewis seems to have endorsed¹⁷ – is just as incredible as metaphysical structuralism. According to epistemic structuralism, all we can ever know about the world are facts concerning its abstract structure. It is not a great consolation to hold that there are haecceitistic or quidditistic facts that go beyond pure structure, if such facts are epistemically inaccessible.

Can we avoid epistemic structuralism without assuming mysterious access to quiddities or haecceities? We can. The arguments in section 4 and 5 relied on some background assumptions that can be questioned. In particular, I have assumed that one can meaningfully characterize the content of evidence and rational belief in terms of metaphysically possible worlds. The trouble that has emerged suggests that we should have a closer look at this assumption.

We could of course abandon the whole idea of modelling content, evidence, and confirmation in terms of possible worlds. If instead we think of belief as a relation to (say) Fregean “thoughts” which are somehow expressed by the complement sentences of ordinary-language belief reports, the theses of haecceitistic and quidditistic humility can’t even be expressed any more – except via principles like (*) that would render them uninteresting.

¹⁷ Lewis clearly accepted haecceitistic humility since he rejected haecceitism (see [Lewis 1986b: ch.4]). [Lewis 2009] strongly suggests that he also accepted quidditistic humility. Chalmers [2012: 345] argues that Lewis might have accepted anti-humility about spacetime, since (a) this would comport with Lewis’s metaphysics of Humean Supervenience, and (b) “Lewis does not anywhere attempt to analyze spatiotemporal notions”. However, (a) Lewis emphasized that the metaphysical fundamentality of spacetime, as assumed by Humean Supervenience, is just an empirical conjecture (e.g. [Lewis 1986a: xf.]), and (b) Lewis nowhere attempts to analyze mass or charge or spin either, although he clearly accepted humility for those. It would also have been odd for Lewis not to mention the exception in [Lewis 2009].

However, I am not ready to give up the possible-worlds conception so quickly. Not just because the framework has earned its keep in Bayesian epistemology, confirmation theory and decision theory, but also because I think the arguments from section 4 and 5 are really getting at something. There is a genuine puzzle here. Moving to a framework in which the puzzle is harder to see is not a satisfactory answer.

A more promising strategy is to question whether our space of metaphysically possible worlds is the right kind of logical space to model the content of knowledge, belief, and evidence. David Chalmers (in [Chalmers 2011] and [Chalmers 2012]) has recently argued that we should posit an autonomous space of epistemically possible worlds that is not constrained by or tied to metaphysical possibility. An epistemically possible world is a maximally specific way things could be for all we know. It is not obvious that these ways always coincide with metaphysical possibilities.

The point would be trivial if we had identified the metaphysical possibilities with (say) dynamical possibilities for the actual world. If the world is deterministic, it might then turn out that the actual world is the only “metaphysically possible” world; but obviously one cannot usefully model the content of rational belief and evidence in terms of truth at the actual world. However, our space of metaphysically possible worlds is not restricted in any such way. If God had to settle that p is true, then we have worlds where p is false, even if p is dynamically necessary. So it is at least not immediately clear why we would need an extra space of epistemic possibilities.

There is also no straightforward argument from a posteriori necessities. Consider some astronomer in ancient Babylon who didn’t know that Hesperus is Phosphorus. One might think that in order to model her beliefs in the possible worlds framework, we would need worlds in which Hesperus is not Phosphorus. And one may doubt that there are such worlds in our combinatorial space. However, that line of reasoning presupposes something like principle (*). We don’t really need worlds where Hesperus is not Phosphorus to model the astronomer’s state of belief. The relevant worlds to which she assigned positive credence are presumably not impossible worlds in which Venus fails to be self-identical. Instead, they are worlds in which a certain body in the morning sky is not identical to a certain body in the evening sky. When the astronomer later discovered that Hesperus is Phosphorus, these are the possibilities she could rule out. Since we have dropped (*), this account is completely neutral on the meaning of ‘Hesperus is Phosphorus’.

There are reasons to think that the space of metaphysically possible worlds is needlessly fine-grained for the purpose of modelling ordinary knowledge and belief. Consider our distant ancestors who never heard about charge or spin. Arguably, a maximally specific epistemic possibility for them wouldn’t need to settle the detailed distribution of these quantities. A whole range of metaphysically possible worlds might therefore correspond to one and the same epistemically possible world for our ancestors. But that doesn’t help to block epistemic structuralism. A disjunction of purely structural truths is still a

purely structural truth.

Epistemic structuralism is not a claim about how we represent propositions in language or thought. When we think that tomatoes are red, we obviously don't entertain a complex logical or structural sentence. Tomato thoughts are not cognitively equivalent to purely structural thoughts, expressible by an infinite disjunction of possibly infinite Ramsey sentences in a hypothetical language \mathcal{L} . One can have tomato thoughts without having the cognitive capacity to even entertain thoughts about fundamental structure. The puzzle raised by epistemic structuralism is not a puzzle about concepts, cognitive roles, or the introspective qualities of thought. The puzzle is about empirical content: about the possibilities that are ruled out when one believes that tomatoes are red. The structuralist hypothesis is that the relevant set of worlds can be characterized in purely structural terms.

To avoid that, what we would need is an epistemic space whose possible worlds are in some respects more fine-grained than complete structural possibilities. Suppose there are epistemically possible worlds that agree in fundamental structure but differ on whether tomatoes are red. Then the hypothesis that tomatoes are red draws a distinction among epistemically possible worlds that can't be drawn in purely structural terms.

But how could that be? All facts, we have assumed, are made true by the fundamental facts. If the fundamental facts concern the instantiation of fundamental properties by fundamental particulars, then the fact that tomatoes are red is ultimately explained by such facts. Moreover, our knowledge that tomatoes are red plausibly doesn't allow us to rule out worlds that differ from the actual world merely by swapping haecceities or quiddities. So the possible-worlds proposition that forms the object of our knowledge can be given in purely structural terms. The present idea therefore seems to imply that while facts about the colour of tomatoes are *metaphysically determined* by purely structural facts, that determination is not epistemically transparent: in our epistemic space, fixing the fundamental structure does not fix the colour of tomatoes.

This kind of idea is well-known from discussions about consciousness. It is often held that facts about conscious experience are metaphysically determined by physical facts, even though there is an epistemic ("explanatory") gap between the physical basis and truths about consciousness. A maximally specific epistemic possibility would therefore have to settle consciousness facts even once all the physical facts are settled.

The idea can be developed in a weak and a strong form. According to the weak version, one could *in principle* infer that tomatoes are red from fundamental structural facts, but the inference is too hard for limited creatures like us. The epistemic gap between structural facts and colour facts would resemble the gap between the Peano axioms and the fact that 99989 is prime. In either case, we can seemingly entertain scenarios in which the premises are true and the conclusion false, although one could in principle rule out those scenarios by a priori reasoning. However, it is doubtful that this kind of

phenomenon can be analyzed in the possible-worlds framework.¹⁸ More importantly, the present proposal hardly offers a genuine alternative to epistemic structuralism. Let's say that a *deep epistemic possibility* is a way things might be that cannot be ruled out by a priori reasoning. On the present account, every deep epistemic possibility is still equivalent to a purely structural possibility.

What we would need, then, is a *strong* independence of (say) colour facts from fundamental facts, so that even an ideal agent who knew all the fundamental facts would still have to look at tomatoes in order to figure out whether they are red. The challenge for any such view is to explain why the colour facts are nevertheless made true by the fundamental facts. Of course one might understand truth-making as a brute and opaque metaphysical relation, or as supervenience within a restricted set of possible worlds. But that is not the sense relevant to our present topic. Our fundamental facts are by definition facts that metaphysically *explain* everything else. How could colour facts be explained by physical facts if there is an explanatory gap between the latter and the former? How can X count as a complete explanation of Y if the assumption that X is true still leaves open whether Y obtains, to the extent that further empirical investigations are required?

All that said, I do think there is a way to defend the autonomy of epistemic space – the idea that an epistemically possible world has to settle things God did not have to settle when creating the world. Roughly speaking, the strategy is to argue that not all our beliefs are beliefs about the world.

8 Projections

Consider self-locating beliefs. Cosmologists tell us that the universe is about 13 billion years old. Intuitively, this is a transient fact: it is true today, but not in the distant past or the distant future. By contrast, the metaphysically fundamental truths are usually thought to be *objective* in the sense that they are the same for you and for me, yesterday and today. That the universe is 13 billion years old is not something God could have settled when creating the world. On the other hand, our knowledge about the age of the universe is genuine empirical knowledge. It is not something we could have figured out a priori, or that could in principle be inferred from a complete objective description of the world. Thus our self-locating beliefs seem to draw distinctions among possible ways things might be that cannot be drawn in the space of metaphysically possible worlds. In this respect, epistemically possible worlds are plausibly richer than metaphysically possible worlds (see [Lewis 1979]).

Admittedly, the case of self-location hardly makes a dent in epistemic structuralism. A structural world together with a designated centre is still essentially structural. Nevertheless, self-locating beliefs set a useful precedent. They illustrate a way for epistemic

¹⁸ For some problems, see [Stalnaker 1991], [Stalnaker 1999b] and [Bjerring 2013].

possibility and metaphysical possibility to come apart that does not rest on a posteriori necessities, opaque relations of grounding, or our limited cognitive capacity. Can we find other phenomena that might fight the same pattern?

Consider normative beliefs. A range of recent meta-ethical views on the borderline between cognitivism and non-cognitivism might be summarized by the following tenets (see e.g. [Gibbard 1990], [Blackburn 1993], or [Horgan and Timmons 2000]). First, there are no metaphysically fundamental normative facts. Second, there is a strong epistemic gap between the fundamental (perhaps microphysical) facts and normative facts: cognitively ideal agents could agree about the fundamental facts and yet disagree about what's right and wrong. Moreover, their disagreement would not merely be a difference in practical attitudes of endorsement, intention, or prescription. That is (third), there are genuine normative beliefs about what is right or wrong. These beliefs can be classified as true or false in a minimalist or deflationist sense, but they cannot be in agreement with objective metaphysical reality. Not all beliefs ultimately serve to represent objective facts about the world. A belief that murder is wrong serves a different kind of purpose than a belief that it is raining, but it is still a belief.

Notice the analogy to self-location. The claim is not that while normative truths are made true by (say) microphysical truths, this determination relation between the microphysical truths and the normative truths is epistemically opaque. On the account just outlined, normative truths, like self-locating truths, genuinely go beyond what is settled by the physical truths, even though they do not represent a further fundamental aspect of reality. A maximally specific way things might be has to be modelled as something like a world-norm pair – in analogy to the world-centre pairs familiar from models of self-locating belief.

Another, rather different phenomenon that might be analyzed in the same style is objective chance. Intuitively, the chance that a radium atom will decay within a certain interval of time is not determined by non-chancy facts about the world. One can seemingly imagine scenarios that perfectly agree with respect to all non-chancy facts, but disagree with respect to chance. On the other hand, there are reasons to doubt that beliefs about chance concern metaphysically fundamental chance facts (see e.g. [Loewer 2004]). The tension between these arguments is resolved by the “pragmatist” or “projectivist” account of chance developed in [Skyrms 1984] and [Jeffrey 2004]. On that account, there are no metaphysically fundamental facts about chance, nor are chance facts determined by fundamental facts. Beliefs about chance do not directly represent objective facts about the world. Rather, to believe that an outcome has a certain chance is to adopt a certain epistemic attitude towards the outcome.

It is tempting to extend this account of chance to other nomic phenomena. [Skyrms 1980] argues that beliefs about the laws of nature can be reduced to “resilient” attitudes concerning non-nomic events.

Two more examples. First, conditionals. Intuitively, we can be more or less certain not just about, say, whether there will be early elections, but also about who will win *if* there are early elections. On the other hand, [Lewis 1976] showed that it is hard to find possible-worlds propositions that could serve as objects of such conditional beliefs. In response, several authors have suggested that conditional beliefs can be evaluated for truth and falsity only relative to something like a world-world pair in which the second world is a maximally specific way things could be assuming that the antecedent is true (see e.g. [McGee 1989], [Bradley 2012]). The metaphysical implications of these ideas are usually left unexplored, but a natural diagnosis is that conditional beliefs do not represent special facts about the world. Conditional truths are neither metaphysically fundamental nor determined by the fundamental facts. Roughly speaking, to be confident that if A then B boils down to having high conditional credence in B given A . The conditional truths that figure in our epistemic space don't trace objective distinctions between metaphysically possible worlds.

Lastly, colours and consciousness. I have mentioned the apparent “explanatory gap” between physical facts and the phenomenal character of conscious experience. We can seemingly imagine worlds that are alike in all non-phenomenal respects and yet differ with respect to phenomenal facts. On the other hand, there are well-known reasons (for example, from the causal closure of physics) to be skeptical about fundamental phenomenal facts. To resolve this tension, one might deny that phenomenal beliefs are meant to capture special, objective, metaphysical facts. Perhaps their purpose is rather to facilitate the process of responding to sensory evidence, as suggested in [Schwarz Unpublished]. Relatedly, it has often been pointed out that when we perceive an apple as red, our visual experience does not seem to represent the apple as instantiating some complex physical or dispositional property. Our experience seems to attribute a simple, basic property to the apple; yet there are good reasons to doubt that the required simple properties exist (see e.g. [Chalmers 2006]). One might therefore argue that the phenomenal content of perceptual experience draws distinctions in colour that are not grounded in other distinctions.

I don't want to suggest that all these proposals are true or even plausible. Personally, I think that some of them are, but I won't try to defend them here. The important point is that they illustrate how the case of self-locating beliefs might extend to a whole range of other phenomena, which would explain why our knowledge and belief seems to go beyond merely structural possibilities even though we have no detectors for haecceities or quiddities. The worlds of our beliefs have a fundamental structure, but they also have colour, consciousness, conditionals, chance, laws, rightness, and tastiness projected onto the screen of fundamental structure. These non-structural features are not fundamental, nor do they track anything fundamental.

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