

Précis of *Metaphysical Emergence*

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Introduction

The notion of metaphysical emergence is inspired by certain target cases, whereby—on the face of it, and in ways I'll expand on shortly—'higher-level' entities (objects, events, and the like) and features (properties, relations, behaviours, and the like) cotemporally materially depend on 'lower-level,' ultimately fundamental physical, micro-configurations and features; yet are also to some extent autonomous, ontologically and causally, from dependence base configurations and features. Relatedly, metaphysical emergence is inspired by a conception of natural and artifactual reality as manifesting a kind of leveled structure generally mirrored in the special sciences vis-à-vis the more fundamental physical sciences.

But what is metaphysical emergence, more precisely, and is there more than one variety of such emergence? And is there (really) any metaphysical emergence, in principle and moreover in fact?

In *Metaphysical Emergence* (2021), I aim to provide clear and systematic answers to these questions. I argue that there are two, and only two, forms of metaphysical emergence capable of accommodating the target cases—one 'Weak' (compatible with a physicalist world-view, given that the lower-level goings-on are physical), one 'Strong' (not so compatible). After defending the in-principle viability of each form of emergence, I consider whether complex systems, ordinary objects, consciousness, and free will are actually metaphysically emergent. I argue that some cases of each phenomenon are plausibly Weakly emergent, and I offer a new argument for there being free will of a Strongly emergent variety.

In what follows, I expand upon this rough overview, summarizing each chapter of *Metaphysical Emergence*. In the interest of efficiency, the presentation sometimes mixes prose with features more characteristic of a visually structured outline.¹

Chapter 1: Key Issues and Questions

In Chapter 1, I begin by canvassing the prima facie motivations for thinking that there is metaphysical emergence (§1.1). To start, scientific orthodoxy takes for

¹ Please keep in mind that this précis necessarily elides what I take to be important dialectical qualifications and content. The book remains the official statement of my view(s).

granted *Physical monism*, understood as contrasting with substance pluralist views such as Cartesian dualism or vitalism:

- *Physical monism*: The only matter or substance is physical matter or substance, such that the matter of a macro-entity at a time is inherited from some micro-configuration of ultimately physical constituents at that time.

Scientific orthodoxy also takes for granted that the features of macro-entities do not float entirely free of features of micro-configurations:

- *Cotemporal dependence*: The features of any macro-entity at a time or over a given temporal interval are at least in part a function of the features of the micro-configuration(s) which materially constitute the macro-entity at that time or during that temporal interval.

Reflecting these commitments, we can say that on the face of it, macro-entities and features *cotemporally materially depend* on micro-configurations and features.

What about autonomy? That macro-entities and features are to some extent both ontologically and causally autonomous from—that is, distinct from and distinctively efficacious as compared to—their underlying micro-configurations and features is motivated by a variety of considerations, including:

- *Distinctive taxonomies*: Special-science entities/features are classified under types which appear to be different from those classifying micro-configurations and features of such configurations (supports distinctness).
- *Distinctive causal laws*: Special-science entities enter into special-science laws describing features and behaviours of, including causal interactions involving, such entities—laws that, on the face of it, are different from those governing physical micro-configurations (supports distinctive efficacy, hence also distinctness).
- *Universal properties and behaviour*: Many special-science entities/features, including thermodynamic complex systems and features, are functionally and causally independent of underlying micro-configurations and features (supports distinctive efficacy, hence also distinctness).
- *Perceptual unity*: Macro-entities such as trees and tables perceptually appear to us as comparatively stable, unified entities, even though (as science tells us) they are materially constituted by complex, constantly changing micro-configurations (supports distinctness).
- *Compositional flexibility*: The existence and persistence of macro-entities/features typically appears to transcend that of underlying micro-configurations, in not depending on any *specific* micro-configuration(s) or features (supports distinctness).
- *Seemingly free will*: It introspectively seems as if we human persons are able to make free choices to produce (or intend to produce) certain effects, where this efficacy appears to be quite different from that associated with the (deterministically or indeterministically) lawfully governed micro-configurations and features upon which we and our mental states cotemporally materially depend (supports distinctive efficacy, hence also distinctness).

On the face of it, then, many macro-entities are *ontologically and causally autonomous* from—that is, distinct from and distinctively efficacious as compared to—

the micro-configurations and features upon which they coterporally materially depend.

There is thus clear good reason to explore the notion of metaphysical emergence, understood as coupling *cotemporal material dependence* with *ontological and causal autonomy*.

Two key questions are immediately salient (§1.2):

1. Just what is metaphysical emergence, more precisely? How is it, exactly, that macro-entities and features can coterporally materially depend on micro-configurations and features, while retaining some degree of ontological and causal autonomy? And is there more than one way in which this can be—is there more than one form of metaphysical emergence?
2. Is there actually any metaphysical emergence? To start: are there any insuperable problems with the notion(s) of metaphysical emergence, such that emergence is, at best, an epistemic or representational phenomenon? And supposing that a given variety of metaphysical emergence is in-principle viable, are there any actual cases of such emergence?

Indeed, in past decades there has been an explosion of philosophical and scientific interest in metaphysical emergence; yet the answers to the key questions have remained unclear. In re the first question: a bewildering variety of accounts of metaphysical emergence has been proposed, appealing to different, often incompatible interpretations of the core notions of dependence² and autonomy.³

² Candidate accounts of the dependence at issue in metaphysical emergence include merological ('part-whole') determination (see Stephan 2002, Gillett 2002), causation or nomological connection (see Searle 1992, O'Connor and Wong 2005), functional realization (see Putnam 1967, Boyd 1980, Poland 1994, Antony and Levine 1997, Melnyk 2003), constitutive mechanism (see Craver 2001, Haug 2010, Gillett 2016), the determinable-determinate relation (see MacDonald and MacDonald 1986, Yablo 1992, Ehring 1996, Wilson 2009), inheritance of causal powers (see Kim 1992, Wilson 1999 and 2015, Shoemaker 2000/2001), and primitive 'Grounding' (see Schaffer 2009, Dasgupta 2014).

³ Candidate accounts of the ontological and/or causal autonomy at issue in metaphysical emergence include nomological but not metaphysical supervenience (see Cleve 1990, Chalmers 1999, Seager 1999/2016, Noordhof 2010), non-fundamental novelty (of features, powers, laws, entities) (see Humphreys 1996, Wimsatt 1996, Crane 2001, Pereboom 2002, Megill 2013), fundamental novelty (of features, powers, forces/interactions, laws, entities) (see Mill 1843/1973, Alexander 1920, Broad 1925, Kim 1992, O'Connor 1994, Cunningham 2001, Wilson 2002 and 2015, Barnes 2012, Paolini Paoletti 2017), non-additivity/non-linearity (see again Mill, Alexander, and Broad, Newman 1996, Bedau 1997, Silberstein and McGeever 1999, Mitchell 2012), 'downward' causal efficacy (see Morgan 1923, Sperry 1986, Klee 1984, Thompson and Varela 2001, Searle 1992, Schroder 1998, Stephan 2002), multiple realizability/universality/compositional plasticity (see Putnam 1967, Fodor 1974, Boyd 1980, Klee 1984, LePore and Loewer 1989, Wimsatt 1996, Antony and Levine 1997, Aizawa and Gillett 2009, Morrison 2012), causal proportionality/difference-making/counterfactual considerations (see Yablo 1992, LePore and Loewer 1987 and 1989, Bennett 2003), elimination in degrees of freedom (see Wilson 2010 and Lamb 2015), sometimes associated with symmetry breaking (see Morrison 2012), and the holding of a proper subset relation between token powers (see Wilson 1999), sometimes cashed in terms of a proper parthood relation between properties and behaviours (see Shoemaker 2000/2001, Clapp 2001, Rueger and McGivern 2010). Also relevant here are 'epistemic criteria' accounts of ontological and/or causal autonomy, including in-principle failure of deducibility/predictability/explicability (see Broad 1925, Hempel and Oppenheim 1948, Klee 1984, LePore and Loewer 1989), pre-

Indeed, the extent of variability has led many to conclude that there is nothing systematic to be said or discovered about metaphysical emergence. The answer to the second key question has also remained unclear, owing to still-live concerns about whether the appearances of metaphysical emergence are genuine. Among these concerns are that metaphysical emergence is naturalistically unacceptable; that considerations of parsimony push against taking the appearances of metaphysical emergence ontologically seriously; that the notion of metaphysical emergence is either trivially fulfilled or trivially never fulfilled; and—perhaps most problematically—that metaphysically emergent entities or features, were they to exist, would give rise to problematic causal overdetermination of effects already produced by micro-configurations/features. Here the diversity of accounts of emergence again muddies the waters; for while some accounts have resources to respond to some concerns, the absence of any systematic treatment of metaphysical emergence renders it unclear whether the notion can survive all the various attacks.

In light of all this, the point and purpose of my book is to provide clear, compelling, and systematic answers to the two key questions of what, more precisely, metaphysical emergence is, and whether there actually is any such emergence. As discussed in §1.3, I go about this project as follows:

- In Ch. 2, I argue that there are two (and only two) schematic forms of metaphysical emergence which accommodate the target cases. One—‘Weak emergence’—is compatible with physicalism, the view that all broadly scientific goings-on are completely metaphysically dependent on lower-level physical goings-on, on the assumption that the lower-level (ultimately compositionally basic) goings-on are physical; the other—‘Strong emergence’—is incompatible with physicalism, on that assumption.⁴
- In Ch. 3, I consider and respond to a range of objections to the viability of Weak emergence.
- In Ch. 4, I consider and respond to a range of objections to the viability of Strong emergence.
- In Chs. 5–8, I consider whether complex systems, ordinary objects, consciousness, and free will, respectively, are actually either Weakly or Strongly metaphysically emergent. For each of these phenomena, I argue that some cases of the phenomenon are plausibly Weakly emergent. For most of these phenomena, I argue that existing arguments for the phenomenon’s being Strongly emergent don’t go through (though in some cases this remains a live empirical possibility). One exception: I argue that there is presently good reason to think that there is libertarian free will of a Strongly emergent variety.
- In Ch. 9, I finish up and point towards work remaining to be done.

dictability, but only by simulation (see Newman 1996, M. Bedau 1997), lack of conceptual or representational entailment (see Chalmers 1996, Van Gulick 2001), and the presence of theoretical/mathematical singularities (see Batterman 2002).

⁴ As I observe, although the assumption that the base-level entities and features are physical or physically acceptable is typically operative in what follows, the schemas generalize to characterize emergence of two different varieties, whatever the precise ontological status of the base-level goings-on.

Besides motivating the book project and setting out the chapter structure, in Ch. 1 I expand on certain suppositions and operative notions informing my investigations (§1.4). In brief:

- *Certain core suppositions.* Notwithstanding their diversity, accounts of metaphysical emergence typically agree on the following theses, which are preserved on my account(s):
 - Metaphysical emergence couples cotemporal material dependence (hence, in particular, does not involve any new substance of the sort posited, e.g., by Cartesian dualists) and some degree of autonomy, where the autonomy at issue is causal as well as ontological.⁵
 - The metaphysical emergence of entities can be investigated by attention to the metaphysical emergence of features of the entities, with the supposition being that if some entity is metaphysically emergent, this is due to its having some characteristic metaphysically emergent feature (e.g., *being conscious*, *being in the basin of a strange attractor*) which can be the target of investigation.
 - Metaphysically emergent features ‘minimally nomologically supervene’ on base features, in that in every world (actual or hypothetical) with the same or relevantly similar laws of nature, the occurrence of an emergent feature *S* requires the occurrence of some or other base feature *P*, and in every such world, the occurrence of any such *P* will be accompanied by the occurrence of such an *S*.
- *The physical.* Discussions of metaphysical emergence as actually instantiated typically suppose that dependence base goings-on are ultimately physical. But what is it for some goings-on to be physical? The account operative here is that I advance in Wilson 2006, according to which the physical goings-on are those which are treated approximately accurately by present or future (in the limit of inquiry, ideal) physics, with the proviso that the physical goings-on are not fundamentally mental—that is, do not individually either have or bestow mentality. Not much turns on the specific details of the account of the physical, however; the main take-home point is that there is at least one physics-based account of the physical up to the task of characterizing the views at issue.
- *The individuation of levels.* It is common to think of metaphysical emergence in the target cases as going hand-in-hand with the suggestion that emergent entities and features are ‘higher-level’ with respect to the ‘lower-level’ goings-on upon which they depend.⁶ But which entities and features should be taken to exist at a given level? An important constraint here is that levels (or the one level, if anti-realism or reductionism turns out to be correct) be individuated so as to include any combinations or configurations of entities and features to which the anti-realist or reductionist may reasonably

⁵ Even with respect to these components there is some dispute; such variations, however, are either subsumable under the core understandings (as I argue is the case for diachronic accounts of metaphysical emergence; see also Wilson forthcoming^b) or else are not to the point of accommodating the target phenomena (hence I put aside epiphenomenalist approaches to metaphysical emergence).

⁶ Note that ‘emergent’ and ‘higher-level’ are not synonymous, however, since non-emergentist views (e.g., Cartesian dualism) also aim to accommodate leveled structure.

appeal. For example, if the basic physical entities are atoms and the basic physical relations include spatial relations and pairwise atomic bonding relations, then we should allow as existing, at the atomic level, not just small numbers of atoms standing in atomic relations, but also large numbers of atoms standing in highly complex atomic (including spatial) relations, constituting pluralities or aggregates of the sort that might, if reductionism is correct, be identical with a rock, a plant, or a person, at least at any given time.

Given this constraint, I offer two different approaches to answering the question of which combinations of entities and associated features should be taken to exist at a given level L of broadly scientific reality, beyond the entities and features typically taken, by lights of the associated science S , to be characteristic of L :

- a. *The lightweight combination approach.* Here the individuation of levels proceeds by allowing that various ontologically ‘lightweight’ (including lower-level relational, mereological, and Boolean) combinations of the characteristic entities and features treated by a given science S and placed at a level L are also appropriately placed at L . For example, the goings-on at the atomic level would include not just atoms and pairwise atomic relations, but any configurations of atoms standing in atomic relations, any boolean combinations of such configurations, and so on.
 - b. *The ‘law-consequence’ approach.* Here the individuation of levels proceeds by allowing that any consequences of laws operating at a given level L , upon which those laws can operate (take as input), are also appropriately placed at L . For example, the goings-on at the atomic level would include any atomic configurations which the atomic laws are capable of taking as input (operating on).⁷
- *The fundamental.* Both physicalists and their Strong emergentist rivals suppose that there are fundamental physical goings-on; where they disagree is over whether there are any fundamental non-physical goings-on. But what is it for some goings-on to be fundamental (at a world, here and throughout)? There are three main approaches (see Tahko 2018 for discussion). On independence-based accounts, what makes it the case that some goings-on are fundamental is that those goings-on are (individually) metaphysically independent. On dependence-based accounts, this is a matter of the goings-on being part of a complete minimal dependence basis for everything that exists. And on primitivist accounts, this is a primitive matter, not metaphysically analyzable in any other terms. (Nota bene that it is not the fun-

⁷ Note that on a law-consequence approach, only those consequences of laws at a given level L preserving the information required for the L -level laws to operate are placed at L . As such, a law-consequence approach does not automatically rule out Weak emergence, notwithstanding that Weak emergentists typically maintain that Weak emergents are in some sense metaphysical consequences of physical laws and conditions. For (as an empirical matter—so Weak emergentists argue) the metaphysical consequences associated with Weak emergents typically abstract away from certain lower-level details (e.g., quantum spin) such that were these input into the physical laws, the laws would not have all the information needed for them to operate.

damenta themselves, but what makes it the case that some goings-on are fundamental, that is on these accounts taken to be primitive). My own preference is for a primitivist account, as advanced in my 2014 and developed and defended in my forthcoming^a and under contract. For the most part, which account of fundamentality is at issue won't matter for what follows, with one exception—namely, an independence-based conception on which individual fundamenta are metaphysically independent (see, e.g., Schaffer 2009, 373; Bennett 2017, 138) rules out fundamenta that are partly but not completely metaphysically dependent on other fundamenta, and so rules out a common understanding of Strongly emergent phenomena. That said, a collectivist variation on an independence-based account, on which the fundamental goings-on collectively do not depend on any other goings on, can accommodate Strong emergence, and so (versions of) all three approaches are suitable for present purposes.

- *Causes and powers.* The discussions to come often advert to causal relations and associated powers to produce effects. More specifically, the schemas for metaphysical emergence that I offer encode certain relations between powers of emergent and dependence base features. There are vast literatures on causation and powers, and on how these notions enter, metaphysically and modally, into the characterizations of entities and features. Fortunately, it is possible to remain almost entirely neutral as regards these more specific details.

To start, the operative notion of 'power' in what follows is metaphysically highly neutral, following the presuppositions operative in my 2015^b:

[T]alk of powers is simply shorthand for talk of what causal contributions possession of a given feature makes (or can make, relative to the same laws of nature) to an entity's bringing about an effect, when in certain circumstances. That features are associated with actual or potential causal contributions ('powers') reflects the uncontroversial fact that what entities do (can do, relative to the same laws of nature) depends on how they are (what features they have). So, for example, a magnet attracts nearby pins in virtue of being magnetic, not massy; a magnet falls to the ground when dropped in virtue of being massy, not magnetic. Moreover, a feature may contribute to diverse effects, given diverse circumstances of its occurrence (which circumstances may be internal or external to the entity possessing the feature). Anyone accepting that what effects a particular causes (can cause, relative to the same laws of nature) is in part a function of what features it has—effectively, all participants to the present debate—is in position to accept powers, in this shorthand, metaphysically neutral and nomologically motivated sense (354).

The operative notion of causation is also highly metaphysically neutral. By way of proof of concept, I argue that even a contingentist categoricist Humean—someone who maintains that causation is a matter of regularities, features have their powers contingently, and all features are ultimately categorical—can accept powers and the associated notion of causation in the neutral sense(s) here. For such a Humean, to say that an (ultimately categorical) feature has a certain power would be to say that, were a token of the feature to occur in certain circumstances, a certain (contingent) regularity would be instanced.

More generally, no controversial theses pertaining to the nature of powers, causation, properties, or laws are presupposed in the discussions or the schemas to follow. That said, I do suppose that we can make sense of physical causation. Some (e.g., Russell, 1912, and Field, 2003) claim that this is problematic; but first, the Russell/Field position is an outside view, as is clear from the usual formulations of physicalism as committed to Physical Causal Closure, according to which any physical effect has a sufficient purely physical cause; second, in any case, I argue that the Russell/Field line(s) of thought can be resisted.

- *Methodology.* Following most contemporary metaphysicians, I implement a broadly abductive methodology (i.e., ‘inference to the best explanation’, per Harman 1965 and Douven 2021), whereby candidate metaphysical accounts of a given phenomenon are assessed by attention to how well they do, overall, at satisfying various theoretical desiderata. To be sure, there is variation in exactly which theoretical desiderata are operative as well as in how these desiderata, which may push in different directions, should be weighted. As I discuss in my 2011, 2016c, and 2016b, this variation is unsurprising, given the wide purview of metaphysical investigations and our present distance from the end of inquiry. Even in the absence of complete consensus regarding methodological standards, progress can be made, so long as one is suitably explicit about which theoretical desiderata are primarily guiding one’s investigations. Two methodological desiderata which I take to be especially important in my theorizing are as follows:

1. *Criterion of Appropriate Accommodation:* An adequate account of metaphysical emergence should make natural (straightforward, default) and realistic sense of the appearances of metaphysical emergence, in the absence of reasons to think that this cannot be done. Hence while I take it to be part of my burden to show that various purported problems with metaphysical emergence can be addressed, I do not take it to be part of my burden to show that no deflationary (anti-realist or reductionist) account of the appearances of metaphysical emergence is viable. My ultimate goal is not to knock the anti-realist or reductionist off their horse, but to show the metaphysical emergentist who aims to accommodate the appearances at realistic face value how to stay on their own horse. I hope that those with different methodological sensibilities will nonetheless find the ensuing discussion useful, at least as revealing the extent to which the heavy weighting of parsimony considerations, as opposed to any specific problem with the notion of metaphysical emergence itself, may be playing a role in deflationary accounts of such emergence.
2. *Criterion of Illuminating Accommodation:* An adequate account of metaphysical emergence should provide an illuminating basis for accommodating the appearances of metaphysical emergence in natural (straightforward, default) fashion. Hence it isn’t enough to simply stipulate, or take it to be brute or primitive, that some goings-on are both cotemporally materially dependent and suitably autonomous; what is desired is one or more intelligible, explanatory account(s) of how there can be metaphysical emergence in this sense.

Chapter 2: “Two Schemas for Metaphysical Emergence”

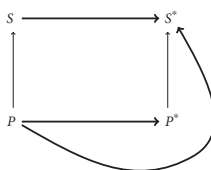
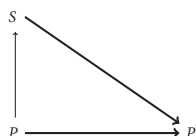
In Chapter 2, I motivate my two schemas for metaphysical emergence by attention to what is seen by many as the most pressing challenge to taking the appearances of metaphysical emergence as genuine—namely, the problem of higher-level causation, made salient by Kim in his 1989, 1993a, 1998, and elsewhere. I argue, following discussions in Wilson 1999, 2001, 2011*b*, and elsewhere, that there are two and only two strategies of response to this problem that make sense of seemingly higher-level entities and features’ being metaphysically emergent as above. One strategy provides a schematic basis for ‘Weak’ (physically acceptable) emergence; the other provides a schematic basis for ‘Strong’ (physically unacceptable) emergence.⁸ For each of these strategies and associated schemas, I show that a representative range of seemingly diverse accounts of metaphysical emergence are plausibly seen as satisfying the conditions in one or the other schema, and thus are more unified than they appear.

I start by presenting Kim’s problem of higher-level causation (§2.1). The general concern is that any purported effects of higher-level features are already produced by the lower-level features upon which they minimally nomologically supervene, such that the metaphysical emergentist is committed to such effects’ being problematically causally overdetermined—that is, problematically caused twice over. More specifically, the problem is usefully seen as involving the following six premises:

1. *Dependence*. Special science features cotemporally materially depend on lower-level physical features (‘base features’).
2. *Reality*. Both special science features and their base features are real.
3. *Efficacy*. Special science features are causally efficacious.
4. *Distinctness*. Special science features are distinct from their base features.
5. *Physical Causal Closure*. Every lower-level physical effect has a purely lower-level physical cause.
6. *Non-overdetermination*. With the exception of cases of the double-rock-throw variety, effects are not causally overdetermined by distinct individually sufficient cotemporal causes.

There are two cases to consider, reflecting two sorts of effect. In Kim’s presentation, *S* is a mental state (e.g., *being thirsty*); *P* is a base state upon which *S* depends; and *S* is taken to cause either another mental state *S** (e.g., a desire to quench one’s thirst) or a base state *P** (e.g., a physical reaching for a glass of water). But the challenge more generally concerns how any real, distinct, dependent higher-level feature might be unproblematically efficacious. The two cases are as follows (bold lines = causation, thin lines = cotemporal material dependence):

⁸ Again, the schemas more generally operate to characterize emergence of two different varieties, whatever the precise ontological status of the base-level goings-on.

Case 1 of the problem of higher-level causation: S causes S^* Case 2 of the problem of higher-level causation: S causes P^*

Kim rejects *Distinctness*, favouring reductive physicalism. But more generally (see Wilson 2015), rejection of each premise is associated with certain prominent views. To start:

1. *Substance dualism*. Deny *Dependence*: avoid overdetermination by denying that S and S^* coterminally materially depend on base features P and P^* , respectively.
2. *Eliminativism*. Deny *Reality*: avoid overdetermination by denying that S and S^* are real.
3. *Epiphenomenalism*. Deny *Efficacy*: avoid overdetermination by denying that S is efficacious.
4. *Reductive physicalism*. Deny *Distinctness*: avoid overdetermination by identifying S with P .

These strategies avoid overdetermination, but don't make sense of higher-level features as metaphysically emergent—that is, as real, dependent, distinct, and distinctively efficacious.

There are, however, two strategies of response to Kim which do accommodate metaphysical emergence:

5. *Strong emergentism*. Deny *Physical Causal Closure*: avoid overdetermination by denying that every lower-level physical effect has a purely lower-level physical cause. This is the strategy encoded in 'British Emergentist' accounts.
6. *Weak emergentism*. Deny *Non-overdetermination*: allow that effects caused by S are also caused by P , but maintain that the overdetermination here is of an unproblematic *non-double-rock-throw* variety. This is the strategy encoded in non-reductive physicalist accounts (e.g., functional realization, determinable-determinate, and constitutive mechanism accounts).

As I argue in the next two sections, these two strategies and associated positions are perspicuously seen as motivated by two conditions on the powers of a given special-science feature, where satisfaction of one or other condition provides a *prima facie* plausible and principled (i.e., appropriate and illuminating) basis for taking the feature to be emergent, in ways that standard proponents of the strategy/position would endorse. In each of these sections, treating Strong emer-

gence and Weak emergence, respectively, I start by motivating the associated condition on powers by attention to standard versions of the position; I then show how satisfaction of the condition dovetails with the associated strategy for responding to the problem of higher-level causation; I then provide prima facie reasons for thinking that satisfaction of the condition provides an appropriate and illuminating basis for taking special-science features to be both cotemporally materially dependent and ontologically and causally autonomous; finally, I use the condition to formulate the associated schema for metaphysical emergence.

The Schema for Strong Emergence

I start with the Strong emergentist strategy, as implemented most saliently by British emergentists (§2.2). The conception of higher-level efficacy at issue in Strong emergentism is, as above, one which denies *Physical Causal Closure*, and is correspondingly incompatible with physicalism. And while different accounts of Strong emergentism emphasize different aspects of this distinctive efficacy as located in fundamentally novel features, laws, effects, forces, or interactions, core and common to these accounts is that Strongly emergent features have fundamentally novel powers—powers to produce effects entailing the violation, in particular, of *Physical Causal Closure*, as per the following condition:

New Power Condition: Token feature *S* has, on a given occasion, at least one token power not identical with any token power of the token feature *P* upon which *S* cotemporally materially depends, on that occasion.

This is true, to start, on British emergentism, as endorsed most systematically by Mill (1843/1973), Alexander (1920), Lewes (1875), and Broad (1925). Hence in his classic survey, McLaughlin (1992) describes British emergentism as

[T]he doctrine that there are fundamental powers to influence motion associated with types of structures of particles that compose certain chemical, biological, and psychological kinds” (52), where the powers at issue are typically taken to be “powers to generate fundamental forces not generated by any pairs of elementary particles. (71)

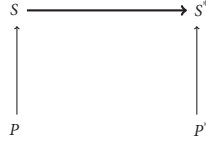
Contemporary accounts of Strong emergence also typically agree in taking emergent features to have or bestow fundamentally novel powers, not had (or had only in derivative fashion) by base features or associated micro-configurations. For example, O’Connor and Wong (2005) characterize emergent features as “fundamentally new”, not just in being (perhaps epiphenomenally) different, but more specifically in having fundamentally novel causal capacities:

[A]s a fundamentally new kind of feature, [an emergent feature] will confer causal capacities on the object that go beyond the summation of capacities directly conferred by the objects microstructure. (665)

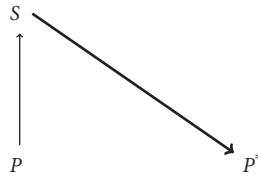
(See also, e.g., Silberstein and McGeever 1999, Wilson 1999, and Van Gulick 2001.)

Given that higher-level feature *S* has a (fundamentally novel) power to cause a given effect—a power that its dependence base feature *P* does not

have—the Strong emergentist’s responses to Kim’s cases can be represented as follows:



The Strong emergentist’s response to case 1



The Strong emergentist’s response to case 2

Prima facie, satisfaction of the New Power Condition by a special-science feature S which cotermporally materially depends on a base feature P provides an appropriate and illuminating basis for avoiding overdetermination while guaranteeing that S is both ontologically and causally autonomous with respect to P . We have thus arrived at our first schema for metaphysical emergence:

Strong Emergence. What it is for token feature S to be Strongly metaphysically emergent from token feature P on a given occasion is for it to be the case, on that occasion, (i) that S cotermporally materially depends on P , and (ii) that S has at least one token power not identical with any token power of P .

Here the locution ‘what it is for’ is intended to flag that Strong Emergence provides a schematic metaphysical basis for a given case of such emergence, encoding what is core and crucial to that notion. Some clarifications:

- The notion of ‘power’ operative in the schema is metaphysically highly neutral.
- The base feature P in the schema is a feature of a micro-configuration (not of an individual component of the configuration), and the conditions should be understood accordingly.
- The first condition encodes substance monism and minimal nomological supervenience.
- The second condition ensures ontological and causal autonomy (distinctness and distinctive efficacy). For Strong emergence, distinctive efficacy involves the higher-level feature’s having a *new power*—a power not had, or not had in same way, by the base feature:
 - Note that the novel token power is fundamentally novel, since non-fundamentally novel powers (powers had just in virtue of aggregation) are had by base feature P .
 - In having a novel token power, S can cause an effect that P can’t cause, or that P can’t cause in the same (non-derivative) way as S ;

hence *S* is causally autonomous—that is, distinctively efficacious—with respect to *P*.

- That a Strong emergent has a token power not had by its base feature *P* entails that *S* is distinct from *P*, by Leibniz's Law.
- The schema is relativized to occasions (times or temporal intervals), but it would be reasonable to suppose that it suffices for the Strong emergence of *S*, simpliciter, that the condition is ever satisfied, and to suppose that it suffices for the Strong emergence of the feature type (of which *S* is a token), simpliciter, that any token feature *S* on any occasion satisfies (or would satisfy) the condition.

The Schema for Weak Emergence

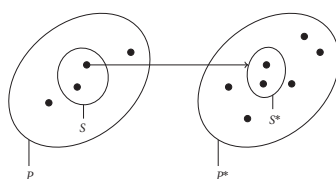
I focus next on the Weak emergentist strategy, as implemented most saliently by non-reductive physicalists (§2.3). Like Strong emergentists, non-reductive physicalists maintain that (some) higher-level features are real, coterminally materially dependent, distinct, and distinctively efficacious with respect to their base features. But as physicalists, their response to the problem of higher-level causation cannot entail the rejection of *Physical Causal Closure*, which is core to the physicalist view that the physical goings-on are an existential and causal basis for all other broadly scientific phenomena. Rather, non-reductive physicalists reject *Non-overdetermination*, maintaining that distinct special science and base features can each be sufficient causes of a single effect, in virtue of standing in a relation that, while not identity, is intimate enough both to avoid overdetermination of the problematic (since implausible, for the cases at issue) double-rock-throw variety and to retain compatibility with *Physical Causal Closure*, hence with physicalism.

Non-reductive physicalists posit a variety of relations as showing how it can be that a higher-level feature can be completely metaphysically dependent on, yet distinct and distinctively efficacious with respect to, lower-level dependence base features. These include functional realization (Putnam 1967, Fodor 1974, Papineau 1993, Antony and Levine 1997, Melnyk 2003, Witmer 2003, Polger 2007, Yates 2012), the determinable-determinate relation (MacDonald and MacDonald 1986, Yablo 1992, Wilson 1999 and 2009), constitutional mechanism (Cummins 1975, Craver 2001, Haug 2010), mereological realization (Shoemaker 2000/2001, Clapp 2001, Rueger and McGivern 2010), and many others. Though there are interesting differences between these accounts of non-reductive realization, I argue that they have in common that each is plausibly such as to satisfy the following condition on token powers of realized and realizing features:

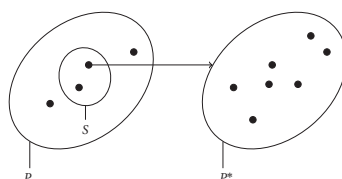
Proper Subset of Powers Condition: Token feature *S* has, on a given occasion, a non-empty proper subset of the token powers of the token feature *P* on which *S* coterminally materially depends, on that occasion.⁹

Representing the features at issue as having overlapping sets of powers, with each power represented as a dot, the non-reductive physicalist's responses to Kim's cases are as follows:

⁹ The requirement that the proper subset of powers be non-empty reflects the rejection of epiphenomenal features as metaphysically emergent, in the relevant sense.



The Weak emergentist's response to case 1



The Weak emergentist's response to case 2

Prima facie, satisfaction of the Proper Subset of Powers Condition by a special-science feature S which cotemporally materially depends on a base feature P provides an appropriate and illuminating basis for avoiding overdetermination while guaranteeing that S is both ontologically and causally autonomous with respect to P . We have thus arrived at our second schema for metaphysical emergence:

Weak Emergence: What it is for token feature S to be Weakly metaphysically emergent from token feature P on a given occasion is for it to be the case, on that occasion, (i) that S cotemporally materially depends on P , and (ii) that S has a non-empty proper subset of the token powers had by P .

Here again, the locution ‘what it is for’ is intended to flag that Weak Emergence provides a schematic metaphysical basis for a given case of such emergence, encoding what is core and crucial to that notion. Some clarifications:

- The notion of ‘power’ operative in the schema is metaphysically highly neutral, as is the supposition that one can make sense of the identity (non-identity) of powers (see my reply to Bennett for further discussion).
- The base feature P in the schema is a feature of a micro-configuration (not of an individual component of the configuration), and the conditions should be understood accordingly.
- The first condition encodes substance monism and minimal nomological supervenience.
- The second condition ensures ontological and causal autonomy (distinctness and distinctive efficacy. For Weak emergence, distinctive efficacy involves the higher-level feature’s having *strictly fewer* powers than are had by the base feature, and hence having a distinctive power profile:
 - Here the response to Kim proceeds by maintaining—contra what Kim assumes—that distinctive efficacy of a higher-level feature does not require that it have a new power.
 - It suffices for distinctive efficacy that the feature have a distinctive power profile, tracking difference-making considerations (if my thirst had been differently physically realized, I would still have reached for

the Fresca), or comparatively abstract levels of causal or nomological grain.

- That a Weak emergent has a distinctive power profile entails that it is distinct from its base feature, by Leibniz's Law.
- Again, the schema is relativized to occasions (times or temporal intervals), but it is reasonable to suppose that (given that S's type is not Strongly emergent) it suffices for the Weak emergence of S, simpliciter, that the condition is ever satisfied, and to suppose that it suffices for the Weak emergence of the feature type (of which S is a token), simpliciter, that any token feature S on any occasion satisfies (or would satisfy) the condition.

I close the chapter by observing that attention to the problem of higher-level causation makes clear the limited ways in which a cotemporally materially dependent higher-level feature can be causally, hence ontologically, autonomous with respect to its base feature, as the operative conception of metaphysical emergence requires (§2.4). First, the feature may have *more* powers than its base feature, as in Strong emergence;¹⁰ second, the feature may have fewer powers than its base feature, as in Weak emergence. In terms of effects: the higher-level feature may be distinctively efficacious in potentially contributing to causing at least one different effect than its base feature (Strong emergence), or it may be distinctively efficacious in potentially contributing to fewer effects than its base feature (Weak emergence). Since complete coincidence of token powers doesn't make room for causal autonomy (distinctive efficacy), these routes to metaphysical emergence exhaust the available options.

I conclude that satisfaction of the conditions in either schema is, as I put it, 'core and crucial' to metaphysical emergence of the sort relevant to realistically vindicating the seeming appearances of emergence as pertaining to special-scientific and artifactual entities and features. Modulo the supposition that the schemas are sensibly filled in, the results of this chapter can be seen as providing *prima facie* reason to think that the conditions in the schemas are both necessary and sufficient for (appropriate and illuminating accommodation of) metaphysical emergence of both physically acceptable and physically unacceptable varieties—a bold claim, but one that, as I argue in ensuing chapters, is surprisingly robust.

Chapter 3: “The Viability of Weak Emergence”

In Chapter 3, I consider and respond to a representative range of objections to the viability of Weak emergence, understood as per the associated schema:

Weak Emergence: What it is for token feature S to be Weakly metaphysically emergent from token feature P on a given occasion is for it to be the case, on that occasion, (i) that S cotemporally materially depends on P, and (ii) that S has a non-empty proper subset of the token powers had by P.

These objections fall into four main categories, according to which satisfaction of the conditions in Weak Emergence is ...

¹⁰ By 'more' I just mean that a Strong emergent must have at least one power not had by the base feature; pace Ney (2022), I do not suppose (and nor does satisfaction of the conditions in the schema require) that a Strong emergent have all the powers of the base feature, and then some.

- compatible with anti-realism about higher-level features (§3.1);
- compatible with reductionism about higher-level features (§3.2);
- compatible with the emergent feature's being physically unacceptable (§3.3); or
- not necessary for metaphysical emergence of a physically acceptable variety (§3.4).

The primary focus of many of the objections is on condition (ii) in the schema—i.e., the Proper Subset of Powers Condition. These diverse challenges can, I argue, be answered. Each of these objections admits of at least one response that could be endorsed by any proponent of Weak emergence, whatever their preferred implementation of the schema. Upon occasion, however, I offer certain attractive responses appealing to either a determinable-based account of Weak emergence (per my 1999 and 2009, developing the proposals in MacDonald and MacDonald 1986 and Yablo 1992), or an account of Weak emergence as involving an elimination in degrees of freedom (per my 2010, developing the proposal in Batterman 1998 and elsewhere).

Here, by way of partial illustration, I sketch certain representative lines of response to each of the four categories of concern.

According to the first concern (see, e.g., Heil 2003, Ney 2010, and Morris 2018), “nothing has been said to rule out” (as Ney puts it) an abstractionist or pragmatist line on seeming satisfaction of the Proper Subset of Powers Condition. I grant that this is the case, but deny that the viability of Weak emergence hinges on accomplishing such a ‘ruling out.’ Given the many *prima facie* reasons for thinking that there is metaphysical emergence, the burden is on the anti-realist to provide reasons for not taking the appearances at face value; but so far anti-realists have not provided any such good reason—in particular, as telling against a Weak emergentist treatment of the appearances. For example, Heil suggests that predicates such as ‘red’ should be understood not as referring to higher-level features, but rather as tracking inexact similarities between lower-level features, especially in light of Kim-style overdetermination concerns; but even granting that the predicates at issue are tracking inexact similarities among lower-level features, this would not show that the higher-level features did not exist, unless it was antecedently clear that the inexact similarities at issue were not themselves higher-level, which it isn't; and as above, the Weak emergentist has a response to Kim's overdetermination concerns, which makes clear how Weak emergents can be causally efficacious in spite of not having any new powers, in virtue of having a distinctive power profile, tracking difference-making considerations and comparatively abstract levels of causal grain.

According to the second concern, even granting that feature *S*'s satisfying the conditions in Weak emergence physical feature *P* ensures that *S* is real and distinct from *P*, this much is compatible with *S*'s being ontologically reducible to—that is, identical with—some *other* lower-level physically acceptable feature *P'* (see Yates 2012, 6, for discussion of the general concern). There are diverse reductive strategies here, according to which *S* is reducible to ...

- a conjunct of a lower-level conjunction (§3.2.1);
- a disjunction of lower-level disjuncts (§3.2.2); or
- a metaphysical consequence of lower-level laws (§3.2.3).

To each strategy I offer one or more responses that any Weak emergentist might accept. In the case of the first strategy (see Shoemaker 2000/2001 for discussion), one might stipulatively rule out conjunctive realization (as Shoemaker does), or implement Baysan's suggestion that, on the supposition that conjunct features are more fundamental than associated conjunctive features, a conjunct feature *S* would not be appropriately taken to satisfy the relevant condition on dependence in the schema for Weak emergence. I additionally note that an appeal to a determinable-based implementation of Weak emergence will suffice to non-stipulatively rule out conjunctive realization, since it is definitive of the determinable/determinate relation that it is not properly metaphysically characterized in terms of anything like the conjunct/conjunction (or relatedly, genus/species) relations (see Wilson 2022/2017 for discussion). In the case of the second 'disjunctive' strategy (see, e.g., Fodor 1987, Jaworski 2002, and Dosanjh 2014 and 2019), I argue that on the usual understanding according to which what it is for a disjunctive type to be tokened on a given occasion is for one of the disjunct types to be tokened on that occasion, the disjunctive strategy is incompatible with satisfaction of the Proper Subset of Powers Condition. And in the case of the third strategy (see, e.g., Nagel 1961, Klee 1984, Kim 2010, and Morris 2018), I observe (see note 7 of this précis) that a proper understanding of how laws enter into the individuation of levels enables the Weak emergentist to maintain that, notwithstanding that special scientific goings-on are, on their view, metaphysical consequences of lower-level physical goings-on, it does not follow that the former are identical with any of the latter, since the former do not contain all the information needed for the lower-level physical laws to operate. I additionally note that a DOF-based implementation of Weak emergence develops this idea, in that on this implementation special-science goings-on may be metaphysical (and even deductive, so to speak) consequences of lower-level physical goings-on, yet be distinct from any lower-level physical goings-on, in failing to have all the DOF that are needed for the lower-level physical laws to operate (as first discussed in Wilson 2010).

According to the third line of concern, that a feature *S* satisfies the conditions in Weak emergence vis-à-vis a given physical feature *P* is compatible with *S*'s being physically unacceptable. Again, there are several variations of the theme of the concern, according to which satisfaction of the Proper Subset Condition on Powers, in particular, is compatible with *S*'s being 'over and above' *P* in virtue of ...

- *S*'s having a non-causal quiddity (§3.3.1);
- *S*'s having a phenomenal aspect (§3.3.2);
- *S*'s failing to be entailed by *P* (§3.3.3);
- *S*'s having a fundamentally mental power (§3.3.4); or
- *S*'s being associated with physically unacceptable constraints (§3.3.5).

In re non-causal quiddities (per Melnyk 2006, Morris 2018), I argue that the Weak emergentist can reasonably maintain that whether *S* and/or *P* have quiddities, shared or not, is irrelevant to whether *S* is physically acceptable, since the occurrence of scientific features, and any truths about such features, does not depend on or otherwise track whether such features have quiddities, much less track how the noncausal quiddities of seemingly distinct features are related; and similarly for artifactual features satisfying the conditions in Weak Emer-

gence. In re phenomenal aspects (per, e.g., Walter 2010), I argue that the common supposition that phenomenal aspects (of mental features, in particular) cannot be characterized in terms of causal roles or associated powers is incorrect; rather, as per what I call the ‘Phenomenal Incorporation Thesis,’ phenomenal aspects of mental features are fully incorporated into the powers of these features (compatible with powers’ being contingently associated with features, relative to a given set of laws), reflecting that differences in phenomenality give rise to causal differences. In re a supposed failure of *S* to be entailed or necessitated by *P* (per Melnyk 2006, McLaughlin 2007), I observe (among other responses) that the cases usually offered as showing that *S* would be ‘over and above’ *P* in not even being nomologically entailed or necessitated by *P* fail to take the cotemporal material dependence condition in Weak emergence into account. In re fundamentally mental powers (per Baltimore 2013), I observe that while the Proper Subset Condition on Powers itself does not rule out *P*, hence *S*, from having fundamentally mental powers, the operative ‘no fundamental mentality’ account of the physical (per my 2006) does so. Finally, in re physically unacceptable constraints (per Melnyk 2006), I grant that when the Proper Subset Condition is satisfied as a result of constraints being imposed on lower-level goings-on, the constraints themselves need to be physically acceptable, and that it might be worth adding this requirement to the schema for Weak emergence (as I explicitly do in my DOF-based implementation of Weak emergence).

According to the fourth line of concern, satisfaction of the conditions in Weak emergence is not necessary for physically acceptable emergence; rather, one or other account in terms of token identity (per Davidson 1970, Macdonald and Macdonald 1995, Ehring 2003, and Robb 1997) (§3.4.1), constitutive mechanism (per Gillett 2002*a*, 2002*b*, 2016) (§3.4.2), constitution (per Pereboom 2002) (§3.4.3), or primitive Grounding (per Schaffer 2009, Rosen 2010, and Dasgupta 2014) (§3.4.4) will do the job. Considerations of space prevent my discussing these alternatives in any detail here; I can say, however, that a common theme is that the views at issue either fail to establish the ontological and causal autonomy of higher-level features, and so are not really accounts of physically acceptable emergence; or else are plausibly seen as imposing the Proper Subset of Powers Condition, and so are not really competitors to my view.

Chapter 4: “The Viability of Strong Emergence”

In Chapter 4, I consider and respond to a representative range of objections to Strong emergence, understood as per the associated schema:

Strong Emergence: What it is for token feature *S* to be Strongly metaphysically emergent from token feature *P* on a given occasion is for it to be the case, on that occasion, (i) that *S* cotemporally materially depends on *P*, and (ii) that *S* has at least one token power not identical with any token power of *P*.

These objections fall into four main categories, according to which satisfaction of the conditions in Strong Emergence is ...

- incompatible with scientific theory or practice (§4.1);
- impossible, since any purportedly novel powers of Strongly emergent features are inherited by (or ‘collapse’ into) base features (§4.2);
- compatible with physical acceptability (§4.3); or

- not necessary for emergence of a physically unacceptable variety (§4.4).

Here again, I argue that these diverse challenges can be answered. And here again, each objection admits of at least one response that any proponent of Strong emergence could endorse, whatever their preferred implementation of the schema. Upon occasion, however, responses draw on features of my preferred ‘fundamental interaction-relative’ account of Strong emergence (as per my 2002), according to which a Strongly emergent entity (feature) has at least one power that is grounded, at least in part, in a novel (nonphysical) fundamental interaction.

Here, by way of partial illustration, I sketch certain representative lines of response to each of the four categories of concern.

According to the first commonly voiced concern, Strong emergence is naturalistically or scientifically unacceptable. In response, I start by observing, following McLaughlin 1992, that Strong emergence would not be incompatible with laws such as $F = ma$ or Schrödinger’s equation, but would rather just involve adding another force or energy to the mix of those input into these laws of nature. I moreover argue, following Wilson 2002, that reflecting that scientific practice suggests that powers are plausibly grounded, one way or another, in fundamental forces or interactions (as when the power of a magnet to attract a pin is grounded in the electromagnetic interaction), naturalistic good sense can be made of the Strong emergentist posit of fundamentally novel powers, as reflecting novel fundamental interactions that come into play only at certain levels of compositional complexity, such that Strong emergentism “is committed to there being at least one other fundamental force beyond those fundamental forces currently posited” (74). Indeed, the case of the weak nuclear interaction, posited in response to apparent conservation law violations in beta decay, supports the naturalistic/scientific respectability of Strong emergence: since a nucleus is a complex entity, evidently scientists have no problem with positing fundamental configurational interactions and associated powers. Similar experiments could provide an empirical basis for Strong emergence, in principle.

Finally, I observe that claims that there is “not a scintilla of evidence” in favor of there being Strongly emergent features (McLaughlin 1992; see also Ladyman and Ross 2007) are overstated, especially in light of the result forthcoming in Ch. 8 (see also my response to McLaughlin, this volume).

According to the second concern, Strong emergence is impossible, due to the base feature’s inheriting any purportedly novel power, as per what Taylor (2015) evocatively calls the ‘collapse’ objection (see Cleve 1990, Kim 1999, O’Connor 1994, Wilson 2002, Francescotti 2007, Howell 2009, Taylor 2015, and Carruth 2018). Drawing on Baysan and Wilson 2017, I offer four strategies for avoiding collapse. Three might be implemented by any account of Strong emergence; these involve (i) distinguishing between direct and indirect having of powers, (ii) distinguishing between lightweight and heavyweight dispositions, and (iii) taking Strongly emergent features to be ‘new object entailing,’ in ways that block lower-level inheritance of powers. The fourth strategy draws on my fundamental interaction-relative account of Strong emergence. On this account, to start, powers are grounded (I make some specific suggestions as to how) in fundamental interactions: as above, magnets have the power to attract pins in virtue of the electromagnetic, not the gravitational, interaction; and so on. One can understand the New Power Condition accordingly. Relative to the set of

purely physical fundamental interactions, a coterporally materially dependent feature S can have a fundamentally novel power p , as per the schema for Strong emergence; relative to the set of any and all fundamental interactions, p will be inherited by the lower-level physical features P upon which S coterporally materially depends.

According to the third concern (due to Yates 2016), satisfaction by a feature S of the conditions in Strong emergence is compatible with S 's being physically realized, hence physically acceptable. By way of illustrative motivation Yates argues that the molecular geometry G of a water molecule is a mathematically specified, physically realized feature which bestows certain powers upon its bearer—in particular, those, including hydrogen bonding in water, associated with the molecule's dipole moment—not had/bestowed by G 's realizers. Here I argue that Yates's reasons for thinking that the powers had by G are not had by the base feature F that 'qualitatively' realizes G on a given occasion do not go through. In particular, he supposes that if such power inheritance were in place, references to G could be eliminated in broadly deductive explanations of the dipole moment and associated powers, yet such references can't be eliminated; but (I observe) nothing in physicalism or in the physicalist supposition that higher-level features inherit their powers from physical base features requires that elements of higher-level explanations, deductive or otherwise, be 'dischargeable' in terms referring only to lower-level physical goings-on. Moreover, Yates maintains that G can be deduced from lower-level physical goings-on, as an "intermediary step"; but then why think that the need to appeal to G indicates that G has new powers, as opposed to thinking that this need simply reflects that the explanation of the existence and powers of the dipole moment has to proceed in steps, compatible with the physicalist assumption that any powers of deducible features such as G are inherited? More generally, I argue that Yates does not establish that the relation of qualitative realization is (like functional and other forms of realization) also a relation of causal power bestowal.

According to the fourth concern, satisfaction of the conditions in Strong Emergence is not necessary for physically unacceptable emergence. There are four main alternative approaches on offer, in terms of ...

- epiphenomenalism (§4.4.1);
- supervenience (§4.4.2);
- primitivism (§4.4.3); or
- epistemic criteria (§4.4.4).

In response, I provide reasons for thinking that each of these alternative approaches to physically unacceptable emergence is unsatisfactory. Again, considerations of space prevent my discussing these alternatives in any detail; here I briefly register some lines of argument.

In re epiphenomenalism (per, e.g., Chalmers 1996): the motivations for making room for an epiphenomenalist conception of emergence rest on there being phenomenal properties, along with the assumption that such properties cannot be characterized in terms of causal roles or associated powers; but as per the 'Phenomenal Incorporation Thesis,' discussed above, this is incorrect. In re supervenience (per, e.g., Chalmers 2006, Witmer 2001): I first canvass reasons for thinking that Strong emergence cannot be characterized as involving nomological but not metaphysical necessity of emergent on base features, since (per sce-

narios highlighted in, e.g., Horgan 1993 and Wilson 2005) Strongly emergent features might supervene with metaphysical necessity on base features. I then offer several responses to Howell's 2009 argument that such scenarios pose no threat to a supervenience-based characterization of such emergence, since metaphysically necessitated features would 'pollute' the dependence base features in such a way that the latter would no longer be properly considered physical, including one according to which (as in the case of a fundamental interaction-based response to the collapse objection) fundamental interactions provide a basis for distinguishing lower-level physical from Strongly emergent goings-on, even when these are deeply dispositionally connected. In re a view on which Strongly emergent goings-on are those which are both fundamental and dependent, and where the notions of fundamentality and dependence are each taken to be primitive (per Barnes 2012): I argue that such a view is too abstract to satisfy the criteria of appropriate and illuminating accommodation; relatedly, it does not provide any clear means of engaging with or addressing either Kim's problem of higher-level causation or the collapse objection, or of ensuring that Strongly emergent goings-on properly contrast with views such as substance dualism. Finally, in re epistemic criteria: I argue that while accounts of Strong emergence as involving one or other epistemic failure have been historically common—per, e.g., appeals to failures of deducibility (Broad 1925), explainability (Horgan 1993), or conceptual entailment (Chalmers 2006), such accounts should be rejected, both because it is clear that the proponents offer the epistemic criteria in service of tracking a metaphysical distinction—in particular, one conforming to the conditions in Strong emergence, and because in any case such epistemic failures are not distinctive of physically acceptable emergence, but can attach to phenomena (e.g., the behaviour of artificial complex systems; see below) for which Strong emergence is clearly not at issue.

Chapter 5: "Complex Systems"

Having established the in-principle viability of both Weak and Strong conceptions of metaphysical emergence, I go on to consider whether certain phenomena are plausibly seen as actually either Weakly or Strongly emergent. I start in Chapter 5 with complex systems, as perhaps the phenomena that have been most often offered as emergent, by scientists as well as philosophers. Complex systems take many forms, both natural (e.g., turbulent water flows, phase transitions, and weather patterns) and artificial (e.g., Conway's 'Game of Life'). And among the distinctive characteristics of complex systems are non-linearity (whereby certain features or behaviours cannot be seen as linear or other broadly additive combinations of features of the system's composing entities), unpredictability (and relatedly, extreme sensitivity to initial conditions), algorithmic incompressibility (whereby the operative equations of motion do not admit of analytic or 'closed' solutions'), 'universality' (whereby certain features are common across diverse micro-structures, especially as associated with asymptotic singularities near critical points), and self-organization (whereby coherent 'system-wide' patterns arise as a result of interactions between parts).

I first consider whether any complex systems might be Strongly emergent (§5.1). I start with a compressed historical discussion of why the British Emergentists (Mill and Broad, among others) took nonlinearity and in-principle failures of predictability to suffice for fundamental novelty (§5.1.1)—a view that,

while reasonable at the time, was undermined by the discovery and creation of complex systems clearly not involving any fundamentally novel powers/interactions/laws. This discussion is useful for appreciating how nonlinearity moved from being a criterion of Strong emergence to being a criterion of Weak emergence (though in ways leaving open, as I argue in §5.1.3, the possibility that some complex systems are Strongly emergent), and for seeing how a recognizable descendant of nonlinearity as a criterion of Strong emergence is present in the aforementioned motivation for new fundamental interactions, reflecting seeming violations of conservation laws. By lights of the latter criterion, I observe, there is presently little support for taking non-mental complex systems to be Strongly emergent (§5.1.4)—though the case is less clear for certain mental phenomena, a topic to which I return in later chapters.

I next consider whether any complex systems might be Weakly emergent (§5.2), focusing on three existing cases for such emergence as involving one or other characteristic of such systems: Bedau's (1997 and 2008) appeal to algorithmic incompressibility (§5.2.1), Mitchell's (2012) appeal to self-organization (§5.2.2), and Batterman's (2000 and 2002) appeal to asymptotic singularities (§5.2.3). I argue that the cases made in these discussions fall short of establishing that complex systems are Weakly emergent, in failing to rule out certain reductionist strategies for accommodating the characteristics at issue. That said, I go on to argue that the prospects for developing these cases in a way that reveals an associated satisfaction of the conditions in Weak Emergence are good (§5.2.4). In particular, after expanding a bit on my (2010) degree-of-freedom (DOF)-based account of Weak emergence, and responding to the concern, due to Morrison (2012) and Lamb (2015), that complex systems involve not fewer but more DOF than base systems (associated with 'order parameters' that emerge near critical points), I argue that complex systems exhibiting universality of the sort Batterman focuses on also have (as he observes) DOF that are eliminated relative to the systems of their composing lower-level entities, and so are Weakly emergent by lights of a DOF-based account. And I go on to offer reasons for thinking that certain other complex systems (Bedau's gliders in Conway's Game of Life; Mitchell's flocks of birds) may also be seen as Weakly emergent by these lights.

Chapter 6: "Ordinary Objects"

In Chapter 6, I turn to the question of whether ordinary objects are either Strongly or Weakly metaphysically emergent. By 'ordinary' objects I have in mind objects which are uncontroversially inanimate (as Thomasson, 2007, puts it) or nonliving (as Merricks, 2003, puts it), and of the sort with which creatures like us are or may be perceptually acquainted. Such objects might be either natural (rocks, feathers, mountains, planets) or artifactual (tables, baseballs, statues). My discussion is broadly neutral on which metaphysical account of objects is correct, so long as a given such account does not rule out of court the possibility that ordinary objects are metaphysically emergent.

I start by considering whether any ordinary objects are either Weakly emergent or (as I will sometimes put it) are 'at least' Weakly emergent, in having at least one feature satisfying the conditions in the schema for Weak emergence (§6.1). I offer three routes to an affirmative answer. First, I argue that ordinary objects of the sort appropriately treated by classical (or 'Newtonian') me-

chanics are Weakly emergent by lights of a DOF-based account, thanks to the elimination of quantum DOF in the classical limit (§6.1.1); second, I argue that a common conception of artifacts as associated with sortal properties and distinctive functional roles, and the associated compositionally flexible persistence conditions typically encoded in these sortal features, supports thinking of artifacts as being at least Weakly emergent by lights of a functional realization account (§6.1.2); third, I argue that ordinary objects typically have metaphysically indeterminate boundaries, which when coupled with an attractive determinable-based account of such indeterminacy (advanced in my 2013 and 2016a), indicates that such ordinary objects are at least Weakly emergent, by lights of a determinable-based account of such emergence (§6.1.3).

I next consider whether any ordinary objects are Strongly emergent (§6.2). I argue that the best case for this stems from the role mentality plays in both the specification and the constitution of the functional roles (typically encoding social practices involving normative or aesthetic goings-on) which are typically associated with artifacts. The ultimate status of such objects as Strongly or rather just Weakly emergent hinges, like the status of certain complex systems involving mentality, on the status as Weakly or Strongly emergent of the associated mental features of persons, of the sort to be discussed in the next chapters.

I close by observing that the results of this chapter undercut the motivations for Thomasson's meta-ontological view, as discussed in her (2010) and elsewhere, according to which investigations into the ontological status of artifactual ordinary objects should proceed differently from investigations into the ontological status of special-science entities (§6.3). Thomasson's suggestion is primarily motivated by thinking, first, that the usually stated concerns with ordinary objects (e.g., Kim-style causal overdetermination concerns) arise from trying to give scientific and ordinary objects (including artifacts) a unified treatment, and second, that the concerns as attaching to scientific goings-on do not admit of any good answers. But as I have argued, there are good responses to the concerns at issue, whether natural or artifactual ordinary objects are at issue. Nothing stands in the way of a systematic treatment of natural and artifactual ordinary objects as at least Weakly emergent, and—contingent upon future empirical results and the import of mentality to be next considered—perhaps even Strongly emergent.

Chapter 7: “Consciousness”

In Chapter 7, I turn to considering whether consciousness or conscious experience of the sort that we and other creatures enjoy is either Weakly or Strongly emergent. There are many forms or species of consciousness, including perceptual awareness of the external world, conscious awareness of internal states (e.g., pain), and self-consciousness (i.e., consciousness of ourselves as conscious beings). Little in this chapter hinges on differences between these forms of consciousness, so I speak generically of consciousness or conscious awareness (or associated mental features), which may have as its seeming object the external world, one's internal states, or (as a special case of the latter) consciousness itself.

I start by considering whether consciousness is Strongly emergent (§7.1). Arguments for consciousness's being Strongly emergent (or in any case physically unacceptable, in a way compatible with being Strongly emergent) typically

rest on the commonly accepted failure of consciousness to be predictable from or explainable in terms of lower-level physical phenomena. Although for reasons mentioned previously, even in-principle epistemic failures can't be the whole story, proponents of these arguments offer reasons for thinking that the explanatory gaps are taken to be metaphysically significant, in reflecting not just mathematical barriers to explanation (e.g., non-linearity), but rather that the subjective or qualitative aspects of conscious experience depart so greatly from lower-level physical features that no physicalist account of consciousness can be correct. I consider the two most promising forms of explanatory gap argument, however, and argue that neither goes through.

I first address knowledge arguments (per Nagel 1974 and Jackson 1982 and 1986) aiming to show that one could have complete physical knowledge of some entity or subject matter, but nonetheless fail to know certain facts pertaining to conscious states associated with the entity or subject matter (§7.1.1). I focus on Jackson's case-based argument, whereby Mary, a scientist confined to a black and white room, comes to possess complete physical knowledge about human color vision; but upon being released and seeing a ripe tomato, learns something new—such that, the conclusion goes, physicalism is thereby revealed to be false. Much physicalist ink has been spilled on responding to Jackson's argument; here I advance a response not much on the books, which proceeds by denying that Mary has complete physical knowledge about human color vision before her release, per what I call the 'Incomplete Physical Knowledge' strategy. I motivate this strategy by observing that a physicalist need not agree that physical knowledge must be 'objective' in the sense of failing to be of subjective or qualitative aspects of reality, since such a view is in tension with physicalism—which maintains, after all, that some sufficiently complex physical goings-on are identical with or realize conscious mental states and associated subjective/qualitative features. Relatedly, I maintain, the physicalist can and arguably should simply grant that acquaintance is a necessary condition for knowing certain physical facts—namely, those providing a constitutive basis for any subjective or qualitative aspects of consciousness there may be. I note certain advantages that the Incomplete Physical Knowledge strategy has over other responses, and diagnose the failure for this strategy to be properly appreciated as reflecting a mistaken characterization of the physical goings-on in overly representational, insufficiently expansive (i.e., appropriately complex), and qualitatively etiolated terms. The upshot is that the knowledge arguments do not provide compelling reason to think that consciousness and its associated subjective and qualitative aspects are actually physically unacceptable, much less actually Strongly emergent.

I next address the conceivability argument advanced and developed by Chalmers (in his 1996, 1999, 2009, and elsewhere), according to which the conceivability of zombies—creatures which are functional and physical duplicates of creatures like us, but which are lacking in any conscious mentality—is taken, in combination with certain other commitments, to establish the Strong emergence of consciousness (§7.1.2). Chalmers's argument goes beyond previous explanatory gap arguments in that the conceivability of zombies is situated in an independently motivated framework—'epistemic two-dimensionalism' (E2D)—according to which certain facts about meaning, which are taken to be a priori accessible, can be used to identify or establish certain facts about modality, expressing or encoding what is genuinely metaphysically possible (necessary, contingent, impossible). It is commonly assumed that the mode of a priori access to

meanings that enters into the E2D strategy proceeds by way of conceiving. Consequently, commitment to the E2D strategy for gaining (much) access to modal truth, and to implementing this strategy via a conceiving-based epistemology of meanings, provides an independent basis for taking the conceivability of zombies to have anti-physicalist metaphysical import, as reflecting a systematic connection between conceivability and metaphysical possibility. The conceivability argument then proceeds as follows:

1. It is conceivable that there is a world which is physically exactly like our world, but in which there is no consciousness.
2. If the world described in (1) is conceivable, then it is metaphysically possible. (E2D)
3. If the world described in (1) is metaphysically possible, then physicalism is false.
4. Physicalism is false.
5. In particular, consciousness is physically unacceptable (and moreover might be Strongly emergent).

The focus of my critical attention here is on the second premise. Drawing on Biggs and Wilson 2017*a* and 2019, I suggest that there is an alternative, and superior, way in which the E2D strategy might be implemented—namely, by appeal to an abduction-based rather a conceiving-based epistemology of the meanings entering into this strategy. I then argue that it is far from clear that the genuine possibility of zombies, or the associated Strong emergence of consciousness, is output from E2D, when this framework is implemented using abduction rather than conceiving. One might wonder, as against this line of thought, whether abduction is apt for purposes of implementing E2D, given that (as above) the access to the meanings which are in turn supposed to provide a basis for access to modal truths is supposed to proceed in a priori fashion. Here again, I draw on joint work with Biggs (Biggs and Wilson 2017*b*), where we argue that, contra common assumption, abduction is an a priori mode of inference—as a priori as conceiving, in particular.¹¹ The upshot is that, like the knowledge arguments, Chalmers’s two-dimensional argument fails to establish that consciousness is actually physically unacceptable, much less Strongly emergent.

I go on to consider whether consciousness is Weakly emergent (§7.2). Here I argue for an affirmative answer, based in the fact that qualitative conscious states—e.g., states of conscious awareness of colors or pains—are typically determinable rather than (maximally) determinate, in a way that defensibly renders them suitable (again, assuming that they are not Strongly emergent) for being realized in determinable-based fashion, and hence Weakly emergent. I first provide two reasons for thinking that various of our perceptions are determinable (§7.2.1), the first being that qualitative mental states are susceptible to Sorites phenomena, and the second reflecting that our perception of macro-entities and

¹¹ Such a view is not as unusual as it might first appear. To start, the view has precursors in Kant (via the notion of the synthetic a priori) and Carnap (and his appeal to conceptual analysis as involving ‘explication,’ which proceeds abductively). Moreover, the view reflects the underappreciated fact that the ceteris paribus clauses in abductive principles (e.g., one or other principle of parsimony) effectively operate to shield them from disconfirmation. See our papers for further details.

their features typically fails to register micro-determinate details. Now, as previously, one implementation of the schema for Weak emergence is a determinable-based account of realization, according to which it suffices for the realization of a feature that the feature be a determinable of lower-level physical determinates. So, if the determinable qualitative conscious states at issue can be seen as having lower-level physical determinates, we will be in position to conclude that such conscious features are Weakly emergent.

I then present arguments, due to Ehring (1996), Funkhouser (2006), and Walter (2006), according to which this does not make sense; here the common line is that while the determinable/determinate relation has some feature F , the relation between qualitative conscious states and lower-level physical states does not have F (§7.2.2). For example, Ehring argues that taking qualitative conscious features to be determinables of lower-level physical determinates is incompatible with the intuitive possibility of there being qualitative mental superdeterminates (e.g., a maximally specific pain), since implying, falsely, that these could be further determined. Drawing on my (2009), I respond to Ehring's and the other concerns by noting, first, that different sciences may treat a single determinable as having different determination dimensions (hence mental features may be superdeterminate relative to a purely psychological science, while being further determined relative to a lower-level physical science), and second, arguing that a proper understanding of the determinable/determinate relation, per

Powers-based Determination: feature P is a determinate of feature Q iff Q is associated with a proper subset of the powers associated with P, and the set of powers had by P but not by Q is not associated with any property,

provides a comprehensible metaphysical basis for accommodating the phenomenon of science-relative determination dimensions. To wit: relative to one set of determination dimensions, reflecting sensitivity to powers associated with the determinable set, a given qualitative conscious state might be characterized as a superdeterminate; but relative to a finer-grained set of determination dimensions (reflecting sensitivity to powers in relevant supersets of the determinable set) that same feature might not be appropriately characterized as a superdeterminate (§ 7.2.3).

Chapter 8: "Free Will"

Free will (or free agency), if such there be, involves the ability to mentally choose an outcome (an intention to ϕ , or a ϕ -ing), where the outcome is 'free' in being, in some substantive sense, up to the agent of the choice. In Chapter 8, I consider whether free will of the sort that we appear to have and to exercise is either Weakly or Strongly emergent.

I start by drawing on Bernstein and Wilson 2016 in order to set up a useful framework for investigating into whether free will is metaphysically emergent (§8.1). Recall that the schemas for Weak and Strong emergence were initially motivated as associated with two specific responses to the problem of higher-level causation. Mental features are a common focus of this problem, but in the usual case the mental features at issue are qualitative or intentional features, for which free choice is supposed not to be at issue. More generally, debates over the status of free will have tended to proceed in relative independence from debates over the status of mental features whose governance by natural law is taken for granted. As Bernstein and I argue, however, the problematics underlying

the free will and the mental causation debates are appropriately seen as special cases of a more general problem, concerning whether and how mental features of a given type may be efficacious, qua the types of feature they are (qualitative, intentional, freely deliberative), given their apparent causal irrelevance—i.e., apparent failure of distinctive efficacy—for effects of the type in question. That the free will and mental causation debates can be seen as special cases of a more general problem serves to suggest certain parallels between positions in the respective debates, which parallels are useful for purposes of assessing whether free will is either Weakly or Strongly emergent.

In the next two sections I develop these parallels for compatibilism and libertarianism, respectively. Again drawing on Bernstein and Wilson 2016, I first argue that a representative range of compatibilist accounts, including accounts of freedom as underdetermination (per, e.g., Ayer 1954), freedom as ownership (per, e.g., Davidson 1963), and freedom as responsibility (per, e.g., Strawson 1962), implement a structurally similar ‘proper subset’ strategy for responding to the problem of free will (§8.2). Effectively, the general compatibilist strategy is to identify a proper subset of the total causal antecedents of a given outcome (effect) of a mental choosing, as that which is relevant for the choosing’s being efficacious qua free; different compatibilists then differ about which proper subsets of the total causal antecedents are those which are so relevant. I then extend this result, arguing that the compatibilist strategy can be more specifically understood as entailing the holding of a proper subset relation between token powers associated with two complex, cotemporal events, corresponding to, first, the mental choosing M in combination with the relevant causal antecedents of M (call this complex event C'), and second, the mental choosing M in combination with the total causal antecedents of M (call this complex event C). I next argue that a representative range of libertarian accounts, including event-causal accounts (per, e.g., Kane 1996 and Merricks 2003), agent-causal accounts (per, e.g., O’Connor 2005), and ‘non-causal’¹² accounts (per, e.g., Ginet 1990, McCann 1998, and Stump 1999) are reasonably seen as committed to free will’s being associated with a fundamentally novel power—namely, the power to freely choose to ϕ —not had by lower-level physical goings-on, of the sort that satisfaction of the schema for Strong emergence requires (§8.3).

Parallels established, I turn to considering whether (some cases of) free will might be Weakly emergent (§8.4.1). The prospects are good, I argue. Though free choices are not taken to be part of a higher-level system of laws on either compatibilist or libertarian accounts, a compatibilist account is one manifesting the usual Weak emergentist characterization of special-science goings-on as comparatively insensitive to lower-level physical details, in the sense that an agent’s reasons for action in a given case float free of many such details (and in particular, are sensitive only to facts about ‘relevant’ causal antecedents). Since our deliberations and associated acts of choice clearly are insensitive to many microphysical details, then given that free will is understood along compatibilist (Weak emergentist) lines, there is good reason to think that such free will actually exists, and moreover is abundant.

¹² Note that non-causal accounts of libertarian free will only require that the choice not be antecedently caused; they are compatible with, and indeed require, that the choice itself be efficacious (hence have powers).

Notwithstanding that there is presumably plenty of what compatibilists count as free will, is there actually free will of a libertarian, nomologically transcendent variety (§8.4.2)? I offer a new argument for an affirmative answer, as follows:

1. We experience ourselves as seeming to freely choose, in ways transcending any nomological (deterministic or indeterministic) goings-on.
2. In the absence of good reasons to think that our experience of nomologically transcendent free will cannot be taken at face value, we are entitled to take this experience at face value.
3. There are no good reasons to think that our experience cannot be taken at face value.
4. We are entitled to take our experience of nomologically transcendent free will at face value.

The argument is valid, and premise (1) is clearly true (even non-libertarians agree). Premise (2) also seems reasonable: if we have clear experience of some seeming phenomenon, we need good reason not to take that experience at face value. I focus on defending premise (3) against the ‘Libet cases’ which pose the most serious challenge to taking our experience at face value.

Recall that Libet (1999) determined that when a subject is asked to move their finger and track exactly when the urge to do so occurs, an unconscious ‘Readiness Potential’ RP precedes the “experience of will” by around 400 milliseconds. Libet and others concluded that conscious will is not the initiator of voluntary action, but instead a consequence of an unconscious physical process that triggers the action. In response, I first canvass certain alternative interpretations of the data, due to Mele (2009) and O’Connor (2005), which are compatible with nomologically transcendent free will. I then offer a new interpretation of my own, which is also so compatible, and which takes advantage of the cotemporal material dependence condition in Strong emergence. On my interpretation, the intention to choose and the associated brain activity are cotemporally initiated, but it takes a bit of time for this fact to consciously register as a complete thought in the agent’s mind. Thinking takes time—more time, perhaps, than a choice. A very small lag—less than half a second—would be a natural concomitant of our mental decision-making processes, compatible with transcendent free will. Correspondingly, Libet’s assumption that “In the traditional view [...], one would expect conscious will to appear before, or at the onset, of the RP, and thus command the brain to perform the intended act” (1999, 49) reflects an overly simplistic account of how nomologically transcendent free will would actually work.

Chapter 9: “Closing Remarks”

In Chapter 9, I summarize the results of the book and call attention to some phenomena whose status as metaphysically emergent deserves further attention, including quantum entanglement, molecular structure, biological systems, brain dynamics, and spacetime. I close with some methodological observations pointing towards other ways in which attention to broadly mereological relationships between sets of powers might serve to shed light on other aspects of higher-level reality, beyond metaphysical emergence.

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