

SHEPHERD’S METAPHYSICS OF EMERGENCE

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The notion of causation that Mary Shepherd develops in her 1824 *An Essay Upon the Relation of Cause and Effect* (ERCE) has a number of surprising features that have only recently begun to be studied by scholars.¹ It is synchronic, rather than diachronic (ERCE 49-50); it always involves a ‘mixture’ of pre-existing objects (ERCE 46-7); and the effect must be ‘a new nature, capable of exhibiting qualities varying from those of either of the objects unconjoined’ (ERCE 63).² In this essay I argue for an emergentist interpretation of Shepherd’s causal theory. On the reading I defend, all effects have qualities that *metaphysically emerge* from the complex interactions of their constituents. This reading explains the structure of Shepherd’s causal relation and clarifies the central aims of her philosophical project. My argument for this interpretation is abductive. No single claim Shepherd makes entails the emergentist reading, but I argue that her views in metaphysics and the philosophy of science, together with her historical context, strongly indicate that she is engaged in an emergentist project.

The emergentist philosophical tradition is typically traced to John Stuart Mill’s *A System of Logic*, which was published two decades after Shepherd’s ERCE. Shepherd was not cited by Mill or any of the ‘British Emergentists’ he inspired (McLaughlin 1992), though it is notable that even philosophers who did read her texts and discussed her ideas did not cite her in their published works.³ Like many other women philosophers, she was written out of the historical record.⁴ Yet the same scientific context that motivated Mill and the British Emergentists was already present during Shepherd’s life, and her causal theory addresses the central questions that continue to concern emergentists to this day. In response to the problems raised by the science of her time, Shepherd developed a theory of emergence and published it during the period when the concept was first being shaped and adopted by prominent philosophers. Her work thus merits a place in the history of emergentist ideas.

I begin by arguing that cause and effect cannot be numerically identical for Shepherd, despite her apparent commitment to cause-effect identity in ERCE. I introduce the notion of metaphysical emergence in §2. In §3, I identify six features of Shepherd’s causal theory that virtually all emergentists agree are central characteristics of metaphysical emergence. In sections

¹ I cite Shepherd’s works as ERCE (for *An Essay Upon the Relation of Cause and Effect*) and EPEU (for *Essays on the Perception of an External Universe*). Citations of ERCE are drawn from (Garrett 2024), and citations of EPEU from (LoLordo 2020), using the original 1824 and 1827 page numbering.

² On synchronicity, see (Landy 2020); on the ‘mixture’ model, see (Wilson 2022), (Landy 2024), (Bolton 2010), and (Boyle 2023). I discuss the ‘New Nature Condition’ of her definition of causation in §3.2.

³ For example, we know that Charles Babbage respected Shepherd’s intellectual contributions: he invited her to his soirees for years, attended her banquets, and even requested her comments on some of his essays before publishing them (Garrett 2024: Letter 2). William Whewell allegedly assigned Shepherd’s work on causation to some of his students at Cambridge (Brandreth 1886), and went on to do extensive work on induction and causal reasoning (Whewell 1837/2010). Yet neither of them cited nor acknowledged Shepherd in any of their written work. This kind of bibliographical neglect is one of the mechanisms by which women have been excluded from the historical record.

⁴ A notable exception is Robert Blakey, who included Shepherd in his *History of the Philosophy of Mind* (Blakey 1848).

§4 and §5, I show that Shepherd shares the same scientific and philosophical context that gave rise to the British Emergentist movement a few decades later. Finally, in §6, I argue that Shepherd’s emergentism is distinctive and departs in important ways from the tradition inspired by Mill. While the two were responding to the same philosophical problems, the details of their solutions are radically different. The purpose of this essay is to open the door to further research on Shepherd’s emergentism by showing that she is aligned with central emergentist commitments and that her historical context renders it plausible that she attempted to develop a theory of emergence.

SECTION 1: SHEPHERD ON IDENTITY AND CAUSATION

In Chapter 2 of ERCE Shepherd puts forward a detailed account of the relation between causes and effects. She begins by arguing for two central principles:⁵ that every beginning of existence requires a cause distinct from itself – the Causal Principle – and that similar causes must produce similar effects – the Causal Likeness Principle.⁶ She follows this with an exposition of the ontology underlying her theory of causation. On her view, all objects are ‘masses of combined qualities’ (ERCE 55), and these qualities necessarily come along with characteristic causal powers (ERCE 53-55).⁷ Objects ‘change their qualities by their mixture with any other mass’ (ERCE 46).⁸ Such a mixture or ‘union’ causes the existence of a ‘new object exhibiting new qualities; or shortly, the formation of a new *mass of qualities*’ (ERCE 50). Each effect comes into existence immediately, and is thus ‘synchronous’ with the union that causes it (ERCE 50). From now on I use ‘cause’ to mean the *complete* cause, which is a union, and ‘partial cause’ to mean one of the objects that contributes to this union.

Partway through her exposition of the metaphysics of causation, she claims that cause and effect are identical:

those *newly formed objects*, or masses of qualities called *Effects*, [...] are therefore *identical* with the *similar cause*; for in *this union*, Cause and Effect are *synchronous*, and they are but different words for the same *Essence*. (ERCE 57)

It is tempting to interpret Shepherd literally: every effect is numerically identical with its cause, and the distinction between them is merely a matter of which word we use to discuss a single entity.⁹ This would provide a concrete foundation for understanding Shepherd’s ontology and the

⁵ (Folescu 2021) has argued that Shepherd takes these principles as axiomatic and known through intuition, rather than reason.

⁶ I follow the nomenclature used in (Boyle 2020a).

⁷ On the essentiality of powers, see (Fantl 2016: 9; Wilson 2022: 169; Landy 2023: 6; LoLordo 2021; Fasko Forthcoming). Landy disagrees that Shepherd is a bundle theorist, though he still thinks powers are essential to qualities. Boyle agrees that ‘the qualities comprising an external object are *causal powers*’ (Boyle 2023: 59) but argues that *sensible* qualities are not analyzed in terms of powers.

⁸ (Boyle 2023: 56) distinguishes between qualities and *sensible* qualities, though this distinction should not be essential to the topic of this paper, as I am not yet considering Shepherd’s view of the mind.

⁹ (Boyle 2023) and (Landy 2024) have both endorsed the identity reading. LoLordo also argues against the identity interpretation, but not on grounds of the irreflexivity of causation (LoLordo 2022: 9).

relation of causes with their effects. For example, it would explain why she claims that cause and effect are synchronic (ERCE 50) and why it is metaphysically impossible for an effect to come about without its cause (ERCE 72).

Nevertheless, Shepherd cannot mean that every effect is numerically identical to its cause. This is because cause-effect identity would contradict Shepherd's Causal Principle, which says that no being can 'begin its existence of itself' (ERCE 35; 39; 44; 48; to name a few). Shepherd says this view is foundational to her system (ERCE 39) and repeats it throughout her works (see EPEU xiv; 56; 138-9). For Shepherd, a cause is a 'producer of new being' (ERCE 63), and each effect 'must owe its existence to some cause' (ERCE 36). If an effect were numerically identical to its cause, it follows that it would owe its existence *to itself*, thus violating a foundational principle of Shepherd's metaphysics. Shepherd's causal relation must be *irreflexive*, ruling out the identity of cause and effect.¹⁰

What relates causes and their effects, if not identity? I argue that Shepherd's causal relation has the core features of *metaphysical emergence*, an irreflexive and asymmetrical dependence relation that has been a central topic in metaphysics and the philosophy of science since the mid-19th century.

SECTION 2: METAPHYSICAL EMERGENCE

Metaphysical emergence relates complex entities to the more fundamental constituents out of which they are made. Emergent entities metaphysically depend on a *base* or *causal basis*, which is generally understood as a collection of more basic constituents. What distinguishes it from other dependence relations, like mereological composition? There are a few characteristic features of emergence, but the heart of the concept is *dependence without reduction*.¹¹ Emergent entities are, unlike mereological composites, not reducible to the base they depend on.¹² However, they synchronically *supervene* on their base, meaning there can't be any change in the emergent entity without a corresponding change in its base at the same time.

The concept of emergence is particularly useful in characterizing the special sciences and non-fundamental physics.¹³ Even though the entities studied in these fields are composed of physical particles, the sciences that treat them have a certain degree of autonomy from physics. Higher-level descriptions of emergent entities are independent of many details about their constituents: no biologist needs to wait for a full quantum-mechanical description of a tiger in

¹⁰ Other considerations also raise problems for the identity reading. For example, Shepherd's causal relation is *asymmetric*, as 'the very meaning of the word Cause, is *Producer* or *Creator*; of Effect, the *Produced* or *Created*' (ERCE 43).

¹¹ There are other ways of putting this, for example (Bedau 1997) talks of *constitution with autonomy*. I stick to reduction, as emergentism is commonly contrasted with *reductionism* as an approach to the foundations of science (Laughlin 2005; Wilson 2021).

¹² At the very least, this means the two must be distinct; what else is required for non-reduction depends on one's metaphysics. For discussions of non-reducibility in emergence see (Kim 1999; Wilson 2021).

¹³ For defenses of emergentism from working scientists see (Anderson 1972; Laughlin and Pines 2000; Laughlin 2005). Anderson doesn't use the term in his influential 1972 paper, but did come to endorse the term after learning about the British Emergentist project and its similarities to his views (Zangwill 2021: 255).

order to study their physiology.¹⁴ Moreover, these higher-level scientific descriptions often rely on concepts that are not applicable at the level of microscopic constituents (for example, biological concepts like *reproduction* or *fitness* do not apply to the chemicals that compose living beings). This is why a non-reductive relation like metaphysical emergence is appealing in the context of the special sciences, and forms part of an anti-reductionist approach to the foundations of science.¹⁵

Emergence is a live philosophical concept discussed by metaphysicians, scientists, and philosophers of science in the 21st century. But the history of the concept goes back to the mid-19th century as a response to problems raised by the scientific context of the 19th century. According to the standard story, emergentism began with John Stuart Mill’s discussion of chemical causation in *A System of Logic* (1843). For Mill and the ‘British Emergentist’ tradition that followed him, the apparent explanatory gaps among the laws governing different areas of science – like physics, chemistry, and biology – posed a problem for the unity of the scientific enterprise.¹⁶ This led Mill to posit that in “special and exceptional” situations, the combination of two substances governed by known physical laws could produce an emergent entity governed by ‘new laws bearing no analogy to any that we can trace in the separate operation of the causes’ (Mill 1843: 373).¹⁷

The notion that certain causal interactions can produce effects governed by ‘new laws’ became the foundation of the anti-reductionist project of modern emergentism. But Mill was not the first philosopher to address the incorporation of the special sciences into a theory of causation. The problem of the unity of science was already present for British scientists and philosophers long before 1843. In sections §4 and §5, I argue that Shepherd shared this context, and intended her causal theory to underpin a unified conception of scientific research.

SECTION 3: SHEPHERD’S EMERGENTISM

In this section I present six points on which Shepherd’s views converge with central emergentist commitments.¹⁸ Both emergence and Shepherd’s causal relation are characterized by complexity (§3.1), novelty (§3.2), modal supervenience (§3.3), synchronic dependence (§3.4), metaphysical hierarchy (§3.5), and non-reduction (§3.6). These are views that virtually all emergentists agree on; aspects of Shepherd’s metaphysics that align only with some conceptions of emergence are not considered.

3.1 Complexity and Shepherd’s Chemical Model

For Shepherd, causation always involves two or more masses of qualities mixing together to

¹⁴ As (Laughlin and Pines 2000) point out, the most general equation of quantum field theory ‘cannot be solved accurately when the number of particles exceeds about 10.’

¹⁵ (Laughlin and Pines 2000).

¹⁶ See (McLaughlin 1992) for a history of British Emergentism.

¹⁷ Mill himself does not use the term ‘emergence.’ It was introduced later by (Lewes 1877), who explicitly references Mill’s discussion of the phenomenon.

¹⁸ LoLordo considers and dismisses the emergentist reading (LoLordo 2022: 10). McDonough argues that Shepherd’s theory allows for ‘modest’ emergence, but he does not consider whether all effects have emergent qualities, as I argue here (McDonough Forthcoming)

form a ‘union’ (ERCE 50) whose qualities differ from those of either mass prior to the mixture (ERCE 63). This notion of *union*, interchangeable with ‘mixture’ or ‘conjunction’ (ERCE 46-7), is central to Shepherd’s ‘chemical model’ of the causal relation (see §4). What characterizes these unions is the ‘mutual and simultaneous affections and interactions of particles or qualities’ (EPEU 293-4; emphasis removed).¹⁹ A union is not a simple mereological sum of two pre-existing objects: it is a complex interaction of the particles or *constituents* of these objects as they enter into a new configuration. In most cases, the result of this interaction of constituents ‘involves the whole original objects in ruins, whilst it strikes out a vast many new and altered ones, creating other masses, other complex objects, totally unlike those whose union was their Cause’ (ERCE 189).

It is standard to think of emergence in terms of the qualitative differences that arise from the complex interactions of a plurality of underlying entities:

The term emergent is used to evoke collective behaviour of a large number of microscopic constituents that is qualitatively different than the behaviours of the individual constituents. (Kivelson and Kivelson 2016)

Emergentists hold that collecting certain quantities of entities in complex arrangements can lead to qualitatively new behavior. The British Emergentists understood this in terms of *configurations* of particles (Broad 1925: 79-80; McLaughlin 1992). In Shepherd’s terms, the ‘formation of particles’ in a mixture is responsible for the new qualities that it produces (EPEU 304).

3.2 *The New Nature Condition*

Shepherd consistently describes effects as ‘new objects exhibiting new qualities’ (ERCE 50; emphasis removed). In her definition of ‘Cause’ she gives substantive content to the claim that effects are ‘new:’

A Cause, therefore, is such action of an object, as shall enable it, in conjunction with another, to form a **new nature, capable of exhibiting qualities varying from those of either of the objects unconjoined**. This is really to be a producer of new being.- this is a generation, or *creation*, of **qualities not conceived of, antecedently to their existence**. (ERCE 63; italics in original, bold emphasis added)

Since Shepherd’s qualities are essentially connected to causal powers (ERCE 53-55), this ‘New Nature Condition’ says that each effect must have at least one power that cannot be exhibited by any of the objects that mixed to produce it. Moreover, to say that the effect’s powers are ‘not conceived of, antecedently to their existence’ is not just to say they are new *token* powers, but

¹⁹ ‘It is not meant that qualities must always unite, but that they mutually affect each other; for whatever may be the nature of their interaction, the argument equally holds good’ (EPEU 313 fn.)

that they belong to a new *kind* (since we use concepts to pick out types or kinds of things, not individual tokens). We can put this claim together with Shepherd’s powers-based account of natural kinds. For example, an effect that looks like snow must have all the characteristic causal powers associated with the natural kind, or else it ‘would not be snow... [it] would require a new name’ (ERCE 69).²⁰ The New Nature Condition thus requires that each effect must have the characteristic causal powers associated with a natural kind to which none of its constituents belong.

The concept of emergence allowed the British Emergentists to causally individuate special scientific kinds in terms of the new behavior that they exhibit relative to their causal basis (Mill 1843/1974; McLaughlin 1992). Likewise, Shepherd’s causal relation allows objects to belong to natural kinds due to their characteristic causal powers, even though they are constituted by mixtures of qualities or particles that lack these characteristic powers. For both Shepherd and emergentists, this marks a departure from mechanistic reductionism, which requires that the behavior of all composite entities be explained entirely in terms of the causal principles governing basic physical particles.

3.3 Supervenience

The foundational pillar of Shepherd’s causal theory is the Causal Principle: that every beginning of existence requires a cause distinct from itself (ERCE 39). After establishing the Causal Principle she argues that it entails the Causal Likeness Principle (CLP): that ‘*a like Cause must produce a like Effect*’ (ERCE 45). This is supposed to follow because violating the CLP would require a ‘difference’ between two effects with like causes, and ‘a difference cannot arise without something to occasion it; else there would be a *beginning of existence* by itself, which is impossible’ (ERCE 45). These two principles entail that effects supervene on causes, meaning there can be no difference in two effects without a corresponding difference in their causes.²¹

For comparison, here is Jessica Wilson’s recent characterization of the supervenience involved in metaphysical emergence:

...any given token of the supervenient (e.g., special-scientific) type requires, for its occurrence, a token of some base (e.g., physical) type; and... if any token of that base type occurs, then a token of the supervening type will occur. (Wilson 2021: 41 fn.5)

The first clause says that the emergent phenomenon requires *some* base in order to occur. This is equivalent to Shepherd’s Causal Principle, which says that nothing can begin to exist without

²⁰ As (Landy 2022) argues, Shepherd’s claim that certain entities “deserve” (ERCE 53), “require” (ERCE 69), or “merit” (ERCE 111) a name indicates a substantive view of natural kinds; see also (LoLordo 2019; Tanner 2022).

²¹ Since emergent supervenience is asymmetrical, a difference in causes does not require a difference in effects, contrary to the interpretations of Boyle and Fasko (Boyle 2023: 39; Fasko 2023; Boyle 2024). While Shepherd sometimes appears to commit herself to the view that dissimilar causes must have dissimilar effects, she also rejects it elsewhere: “Apparently like objects may in every sensible quality be similar, and yet they may essentially differ in their remote causes” (EPEU 268).

some cause distinct from itself. The second clause says that any two bases of the same type must give rise to emergent entities of the same type. This is equivalent to Shepherd’s CLP, but stated in terms of ‘supervenient types’ and ‘base types’ (rather than ‘like effects’ and ‘like causes’). Emergentists are not the only ones interested in supervenience, but it is a universal emergentist commitment.²²

3.4 Synchronic Dependence

Shepherd disagrees with Humean orthodoxy by claiming that cause and effect are always ‘synchronous’ (ERCE 50). This means that effects begin to exist at the very first moment that their (complete) cause is present:

Antecedency and subsequency, are therefore immaterial to the proper definition of Cause and Effect; on the contrary... when [an object] acts as a Cause, its Effects are synchronous with that action... (ERCE 49-50)

(Landy 2020) models Shepherd’s theory in terms of instantaneous causal relations. On his reading, the cause produces the effect in one moment, and the effect then exists independently for the rest of its duration. Landy is right that causal relations are instantaneous, as they only produce beginnings of existence, and not the continuation of existence (ERCE 38-9; EPEU 407). But his view is wrong insofar as Shepherd insists that effects continue to be synchronously dependent throughout their existence.²³ She claims that we ought to think of all effects as ‘dependent qualities’ (ERCE 37-38; emphasis removed), and as ‘manifestations’ of the interactions of eternally existing fundamental qualities (ERCE 98; EPEU 190). These fundamental qualities make up the essence of God, the ‘one uninterrupted essentially existing cause’ of all phenomena (EPEU 152). She also describes effects as qualities that ‘inhere in their objects’ (ERCE 63), and says that even ‘God could not make a finite quality, *dependent* upon himself or some other cause for its exhibition, to become *independent* and able to *exist of itself*’ (ERCE 72).

These claims indicate that effects are never capable of existing independently. Moreover, every current interpretation of Shepherd’s causal metaphysics, other than (Landy 2020), entails that effects are continuously dependent throughout their existence. The identity reading is logically committed to this view (Boyle 2023; Landy 2024);²⁴ it is also implied by (Cruz 2024)’s substantialist reading, since accidents depend on substances continuously, not instantaneously; and it follows from Fasko’s emanationist view that says effects are ‘grounded dispositions’ (Fasko Forthcoming). No reading of the metaphysics of Shepherd’s causal relation, other than (Landy 2020), allows for effects to exist independently at any point of their duration.

²² (Kim 1990) claims that the concept of supervenience was first developed and popularized by the British Emergentists.

²³ Thank you to Jessica Wilson for bringing this issue to my attention.

²⁴ Landy endorses the identity reading in (Landy 2024), but never addresses how this can be made consistent with the instantaneous reading he proposed in (Landy 2020).

The emergentist reading provides the best account of synchronic dependence in Shepherd’s metaphysics. On the identity reading, the effect must coexist with the mixture that causes it for its entire duration, on pain of contradiction. But this fails to capture Shepherd’s view that an entity can continue existing through changes in its underlying constituents: once a fire is lit, ‘the flame may be kept alive for ever, by the constant *addition* of such substances [i.e., “combustible matters”]’ (ERCE 182).²⁵ On the other hand, emergence is compatible with *multiple realizability*, the view that the same emergent entity could depend on different underlying collections of constituents.²⁶ An emergent entity (like a fire) can come into being in dependence on a particular base (like a wooden stick), yet continue existing when this base changes (say, to a wooden log), so long as the same emergent properties continue to be produced by these new constituents.

To understand how Shepherd can maintain that effects are continuously dependent on changing constituents, we must attend to her notion of a *secret constitution*. Shepherd defines causes as only responsible for *beginnings* of existence (ERCE 38-9; 63), and claims that the *continuation* of existence does not require a new cause (EPEU 407).²⁷ Instead, she repeatedly states that dependent objects have a ‘secret constitution’ (ERCE 116-19) that they depend on throughout their duration.²⁸ The secret constitution of a dependent object does not need to be numerically identical to the cause, but it must maintain the same ‘formation of particles’ as the cause (EPEU 304). On the emergentist reading of Shepherd, the secret constitution should be understood as the *base* of the emergent entity, which can undergo changes in constituents so long as these remain in the same configuration.²⁹ Emergentism thus allows effects to be ‘dependent qualities’ throughout their duration, without committing Shepherd to the implausible view that effects continue to depend on the very same collection of constituents that formed their initial cause.

British Emergentists have described emergence in terms of *composition* (Mill 1843: 371) and *constitution* (Broad 1925: 45), paradigmatic synchronic dependence relations. Later emergentists have made this even more explicit. In her 2016 survey of theories of emergence, Wilson claims ‘nearly all accounts of emergence’ agree that it is a relation of synchronic dependence (Wilson 2016: 346).³⁰

3.5 Metaphysical Hierarchy

Shepherd commits herself to a multi-level hierarchy of causes underlying our sensations. She

²⁵ Thank you to an anonymous reviewer for pressing me on this point and highlighting Shepherd’s view that effects can persist through changes in their underlying constituents.

²⁶ Multiple realizability was a central concept in functionalist views in the mid-20th century, such as (Putnam 1967) and (Fodor 1974). (Wilson 2016) argues that these views share the core features of *weak* emergentism.

²⁷ As (Landy 2020) explains, this view is necessary for her synchronic account of causation to avoid temporal collapse.

²⁸ She sometimes refers to these as ‘internal constitutions’ in the same passages.

²⁹ What current emergentists call the *base* of an emergent entity thus goes by two different names for Shepherd: it is a *cause* in the first moment of production, and a *secret constitution* afterwards.

³⁰ (O’Connor and Wong 2005) are among the few that defend a diachronic version of emergence.

thinks mixtures of God’s qualities (including ‘wisdom’ and ‘benevolence’) are the ultimate, continually existing cause of all phenomena (ERCE 96-7). But she clarifies that sensations are ‘not immediate acts of Deity, but mediate acts of Deity’ (EPEU 241). Our experience is not directly dependent on God, but rather on ‘secondary causes beneath our view’ (EPEU 152). These statements imply at least three levels in this metaphysical hierarchy:³¹ the complete causal story of the empirical world begins with God at the base, passes through some unperceived ‘secondary’ causes that depend on God’s essence, and ends in sensations that depend on these secondary causes.

Emergentists are also committed to a synchronic multi-level hierarchy of metaphysical dependence underlying our experience of the empirical world. This is sometimes described as a ‘layer cake’ picture of reality.³² The world of the emergentist consists of multiple levels of organization, such that each dependent level exhibits new types of causal behavior that are not present at any of the lower levels it depends on.

3.6 Unification of Science Without Reduction

Accounting for new chemical discoveries was an important task for 19th century philosophy of science.³³ It is not easy to fit chemical reactions into the traditional early modern model of causation, which took as its paradigm case a billiard ball imparting its force to another by impact. Shepherd’s theory addresses this unification problem by making chemical synthesis the paradigm case of causal interaction: all causation involves previously existing masses of qualities uniting to generate a new nature.

Shepherd intends her causal relation to underpin a unifying theory of the scientific enterprise. At the end of ERCE, she claims that her views are ‘the only true foundations of scientific research’ (ERCE 194). She later proclaims the unity of science by arguing that there is really only one law of nature, that like causes must have like effects – her Causal Likeness Principle (EPEU 290). Shepherd also unifies all reasoning under the same category, leading her to claim that even ‘mathematics is truly but one branch of physics’ (EPEU 278-9). Shepherd’s causal theory is supposed to capture all inferences in all domains, providing a complete unification of empirical and abstract reasoning.

Shepherd’s emergentist perspective on the unity of science is manifest in her discussion of biological and psychological phenomena. She sees the study of living and sentient behavior as having autonomy from other sciences, even though living and sentient beings depend on causes.³⁴ She rejects William Lawrence’s attempt to ‘reduce’ biological processes to inorganic chemistry (ERCE 180), and expresses skepticism that sentience can be accounted for in biological terms (ERCE 169).³⁵ Her insistence on the autonomy of the special sciences is a result

³¹ She describes a similar three-level hierarchy at ERCE 176.

³² (Bennett 2017). (Wilson 2021: 13 fn.) clarifies that emergent structures need not break up into neat layers, so that an account of a human being’s behavior might appeal to processes at multiple different levels of organization.

³³ See §4 for more details.

³⁴ For example: ‘a different action of brain is wanted for *each variety of thought and sensation*’ (ERCE 171).

³⁵ Even when she considers that sentience might be a ‘dormant quality of all matter’ (EPEU 375), she claims that

of the emergentist features of her causal relation. Effects synchronically depend on mixtures of underlying constituents, but the New Nature Condition (§3.2) tells us that the forward-facing causal role of these effects is distinct from those of their constituents. An emergentist commitment to the autonomy of effects is thus built into Shepherd’s notion of the causal relation. This allows her causal theory to provide a unified foundation for the practice of science while avoiding reductionism at every step.

A primary aim of emergentists is to give a unifying account of the foundations of science without reductionism.³⁶ This aim is already present in the work of J.S. Mill. His emergentism was motivated by chemical discoveries that could not be explained in terms of the best extant physical models. The British Emergentists addressed this problem with a distinction between emergent and resultant effects. Shepherd did not have the same response, as she proposes a unified causal relation that applies to all scientific research (I return to this contrast between Shepherd and the British Emergentists in §6). Yet she shares the aim of incorporating the structure of chemical, biological, and psychological interactions into a theory of causation, while allowing each to retain some autonomy from more fundamental sciences.

3.7 Causation and Emergence in Shepherd’s Metaphysics

I have canvassed six emergentist features of Shepherd’s causal relation. But what does it mean to say that all effects are emergent?³⁷ How can Shepherd replace the familiar everyday notion of cause-and-effect with emergence, a highly specialized philosophical concept?³⁸

To answer this question we must be careful not to conflate the structure of Shepherd’s causal relation with our pre-reflective assumptions about how causation works. Shepherd’s causal relation is *vertical* rather than *horizontal*. This spatial metaphor captures the contrast between (‘horizontal’) diachronic relations among events at different times, and (‘vertical’) hierarchical relations among entities at different levels of organization. On a Humean picture, the asymmetry of cause and effect is captured in terms of temporal priority (*Treatise* 1.3.2.7; 1.3.14.35), making his a paradigmatically horizontal conception of cause and effect. Shepherd’s causal relation is ‘vertical’ because it is synchronic, with the asymmetry of cause and effect being captured by the dependence of effects on their more fundamental causes (LoLordo 2022: 10).

Shepherd provides a helpful example in both ERCE and EPEU that illustrates the inter-level structure of her causal relation:

this quality would need to be studied in terms of its characteristic sentient effects, not in reductive physicalist terms (EPEU 376).

³⁶ (Laughlin 2005); (Broad 1925).

³⁷ Thanks to an anonymous reviewer for pressing me on this point.

³⁸ I am not the first to suggest a tight connection between these concepts: ‘To caricature emergentism just slightly, supervenience is a kind of “supercausation” which improves on the original in that supercauses act immediately and metaphysically guarantee their supereffects’ (Yablo 1992: fn. 29). This is consistent with Mill’s characterization of emergence in terms of the ‘conjunct action of causes’ (Mill 1843/1974: 370). Emergence as a form of causation is comparable to the ‘formal’ and ‘material’ causes of the Aristotelian system, both of which are synchronic dependence relations that cannot be understood in terms of simple identity (Falcon 2023).

blue and yellow mixed in their particles, will form the colour termed green: yet that experience must be reasoned on before it can show, that by, in, and with the mixture of particles, there exists immediately green as a new quality in nature (EPEU 294-5)³⁹

Blue paint mixed with yellow paint makes green paint - a familiar enough phenomenon. But Shepherd emphasizes that it is the mixture of ‘their particles’ that is responsible for the green color that results. The blue quality and the yellow quality at time T1 are not the cause of the green quality at T2; yellowness and blueness do not make greenness.⁴⁰ Rather, it is the underlying particles that make the blue paint blue, the yellow paint yellow, and upon mixture, the green paint green (Figure 1). These particles are the ‘secondary causes beneath our view’ that she discusses at EPEU 152.

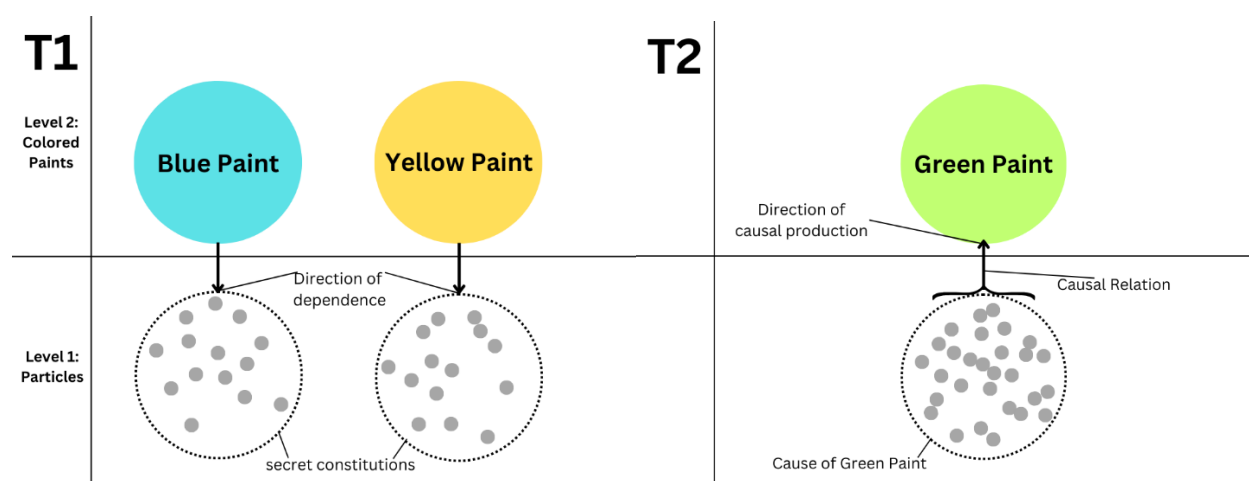


Figure 1. Colored Paints Model ⁴¹

If we were to describe this process in ‘Level 2’ terms, it would appear as a ‘horizontal’ causal sequence.⁴² But this would be a misrepresentation, because neither the blue nor yellow paints are the genuine complete cause of the green paint. Rather, all three are higher-level phenomena whose existence is synchronically dependent on mixtures of particles rather than colored paints. The blue and yellow paints are the pre-existing ‘whole original objects’ that are left ‘in ruins’ upon mixing (ERCE 189); what remains are the individual qualities that formed the

³⁹ See also ERCE 101 fn.

⁴⁰ Shepherd does introduce a notion of *partial* causes that captures the sense in which the yellow paint can be called a cause of the green paint. But this sense of causation is derivative; the yellow paint is a cause of the green because its particles are capable of entering into a new mixture that gives rise to the green color (ERCE 63).

⁴¹ The directional arrows indicate the asymmetry of the causal relation. Readers should note that both directions (dependence and production) apply equally at both T1 and T2, despite only one direction appearing in each frame of Figure 1.

⁴² One may worry that the diachronic process of mixing of Level 1 particles lacks a causal explanation. As (Landy 2020) and (Bolton 2010) point out, Shepherd believes motion is a stable quality of objects: an object moving along its inertial trajectory does not constitute a ‘new quality’ and therefore this change of position does not require a cause.

‘masses’ composing those objects (ERCE 55). ‘*Causal relation*’ is Shepherd’s term for the initial inter-level dependence relation that produces a new quality in the first moment of its existence (i.e., the upward-pointing arrow at T2). Once produced, the emergent quality continues to depend on its ‘secret constitution’ (ERCE 118), which is related to but not identical to the cause (see §3.4). While this secret constitution is not the same as the cause, it must exhibit the same ‘formation’ of particles that initially brought the effect into existence (ERCE 120; EPEU 304). This allows the constituent particles to be replaced so long as their collective structure remains the same (ERCE 182). As I mentioned when discussing temporal duration (§3.4), this is consistent with an emergentist causal model that allows for the same effect to be realized by different collections of constituents.

SECTION 4: SHEPHERD’S CHEMICAL MODEL OF CAUSATION

The central philosophical problem that motivated 19th century emergentists was already present during Shepherd’s life: how to maintain the unity of the scientific enterprise after the chemical revolution and the fragmentation of science. Just like the later British Emergentists’, Shepherd’s emergentist ideas were a response to the scientific and philosophical problems of her time. This section concerns the issue of chemistry, the next concerns the fragmentation of science through the rise of the other special sciences.

Shepherd responds to the discovery of chemical reactions by subsuming all causation under a chemical model, rather than explaining chemistry in mechanical terms. But the centrality of chemistry to Shepherd’s view of science has not been properly defended in the scholarly literature. To make the case that Shepherd’s focus on chemistry is aligned with 19th century emergentist motivations, I must establish that Shepherd really did have a chemical model of causation. LoLordo defends this claim, but largely on the basis of a passage in an anonymously published 1819 treatise which had been attributed to Shepherd (LoLordo 2019). Deborah Boyle has since shown that this is a misattribution (Boyle 2020b), undermining LoLordo’s evidence.⁴³

In this section I argue that 1) Shepherd saw the laboratory of the chemist as the primary locus of scientific discovery, and had a sophisticated understanding of the tools and processes of chemical research; 2) she and her interlocutors were immersed in the burgeoning field of *chemical philosophy*; and 3) she intended her causal model to be applicable to the structure of chemical reactions, and would have expected her readers to understand this. All in all, there is sufficient textual and contextual evidence to conclude that Shepherd was indeed presenting a *chemical model* of causation. This is well-explained by the emergentist reading, which sees the unification of different scientific fields as a central aim of Shepherd’s causal theory.

⁴³ The treatise was included in McRoberts’ edition of Shepherd’s works (McRobert 2000), but Boyle shows that it was likely written by James Milne. Boyle never denies that Shepherd has an interest in chemistry, though she emphasizes Shepherd’s interests in biology instead (Boyle 2023: 44). This is compatible with my emergentist reading, as the incorporation of biological causation is also part of the unification of science that all emergentists aim at. But the evidence (presented below) points more strongly to a focus on chemistry, which was by far the more developed and precise science during Shepherd’s time.

4.1 Shepherd on “the laboratory of the chymist”

Multiple times throughout her works, Shepherd brings up the chemistry lab when reaching for an example of where empirical discoveries occur. She claims that her argument for the Causal Likeness Principle is ‘the only foundation for the demonstrations of the laboratory of the chymist; which all life resembles’ (ERCE 44). When discussing the Newtonian posit of universal gravitational attraction in EPEU, she says that

no organ of sense ever detected it; no experiment ever found it; no reasoning ever deduced it from admitted premises; the laboratory of the chymist never elicited it from any convincing trial... (EPEU 363)

It is also evident from her writing that she was familiar with the tools and processes of chemistry. She refers to the *receiver*, a glass container that was regularly used by chemists:⁴⁴

Let us however, before quitting this important and interesting argument, chuse an example to prove, that “nature cannot without a contradiction be imagined to alter her course.” Let a receiver be imagined void of every substance whatever; and nothing but an uncoloured space within it... (ERCE 85)

She returns to the example of the receiver when she claims that no ‘trial of the receiver, the retort, or the cylinder’ will reveal the original cause of motion in the universe (EPEU 365). The retort and the cylinder were two other pieces of chemical equipment common in Shepherd’s time.⁴⁵ Shepherd regularly cites the chemist, their laboratory, and their tools when giving examples of scientific discoveries.

4.2 Shepherd and the chemical philosophy

Not only was Shepherd familiar with the tools of chemistry, she also understood the theoretical basis of *the chemical philosophy*. For example, she refers to ‘elective attractions’ (EPEU 368). Interchangeable with ‘elective affinity,’ this term was a key concept in the chemical theory of the early 19th century. Elective attraction or affinity refers to the tendency of chemicals to react only with certain substances but not others (Whewell 1837 Ch.3). This is what differentiated chemistry from mechanical physics, where all particles are of the same type and react the same in similar circumstances.

Shepherd’s contemporaries were also immersed in the chemical philosophy. Take for example her two contemporary opponents in ERCE, Lawrence and Brown, who were both clearly influenced by the chemical revolution.⁴⁶ This is evident in the citations of Lawrence in

⁴⁴ Receivers had been used in distillation for centuries before Shepherd’s time (Krell 1982).

⁴⁵ See page 180 fn. 8 of (LoLordo 2020).

⁴⁶ Another example is John Leslie, the subject of the ‘Leslie Affair.’ His endorsement of Hume kickstarted the controversy to which Shepherd’s ERCE is a response (ERCE 5). At the start of *An Experimental Inquiry into the Nature and Propagation of Heat*, he sets his theory apart from the scientific mainstream by rejecting the “theory of

ERCE: Shepherd characterizes his project as attempting to ‘reduce [elementary animal structures] into the inorganic matters of nitrogen and gas’ (ERCE 180). Shepherd also responds to Brown’s *Observations*, which is replete with references to ‘all the brilliant discoveries of modern chemistry’ (Brown 1806: 33). He even describes ‘a philosophic chemist, who forms combinations of bodies, in the confidence of deriving from them a product altogether new’ (Brown 1806: 13). This description resembles Shepherd’s view that effects are new qualities arising from the union of previously existing objects (ERCE 47). Shepherd and her contemporaries would have recognized that her causal model exhibits the known structure of chemical reactions.

The chemical revolution was the scientific background against which natural philosophy was occurring in Shepherd’s milieu. The chemical discoveries of the late 18th century were generally recognized *as revolutionary* at the time, as was famously pointed out in Kuhn’s *The Structure of Scientific Revolutions*.⁴⁷ Scientists quickly adapted to the new research questions and tools of the chemical philosophy.⁴⁸ This is acknowledged in *History of the Inductive Sciences*, published in 1837 by William Whewell, Mary Shepherd’s friend and philosophical correspondent.

Few revolutions in science have immediately excited so much general notice as the introduction of the theory of oxygen... above all, the construction and universal adoption of a nomenclature which applied to all substances, and which seemed to reveal their inmost constitution by their name, naturally gave it an almost irresistible sway over men's minds. (Whewell 1837/2010: 128)

Given Shepherd’s familiarity with chemistry’s tools and concepts, the clear influence of chemistry in Shepherd’s intellectual circle, and the ‘extraordinary rapidity’ with which oxygen theory spread (Whewell 1837: 132), it is quite certain that Shepherd was familiar with the core tenets of the chemical philosophy.

4.3 Combustion and the union model

After introducing her model of causation as union (ERCE 46), Shepherd’s first concrete example of causation is fire (ERCE 47-8), and she returns to this example multiple times throughout the text (ERCE 53-55, 57, 123-125). Shepherd’s readers in the 1820s could not have read this example without thinking about Lavoisier’s discovery of oxygen and the demise of phlogiston theory. This is especially true given that Shepherd claims all causation involves the union of

Radiant Heat, espoused of late years by chemical philosophers” (Leslie 1804/2014). He later raises a Humean objection against the existence of elements like oxygen, claiming they are “mere fictions of system” (Leslie 1804/2014: 148). He accepts only the existence of *oxygenous gas*, which is observable.

⁴⁷ (Kuhn 2012). Although Kuhn’s general theory is controversial, his account of the chemical revolution has been found to stand up to scrutiny (Hoyningen-Huene 2008).

⁴⁸ An exception was Joseph Priestley, who famously defended phlogiston theory until his death in 1804 (Whewell 1837/2010: 134).

distinct objects. Phlogiston theory had claimed that combustion was a *subtraction*: phlogiston was present in flammable objects, and combustion was the process by which these objects would lose their phlogiston content. Lavoisier undermined phlogiston theory by showing that combustion actually consists of the combination of oxygen with flammable materials (Hoyningen-Huene 2008).

It is noteworthy that Shepherd uses combustion as the first example of her model of causation as the union of pre-existing objects. Her readers would have realized that she was pointing to the chemical philosophers' account of combustion, the most significant scientific discovery in recent memory. A clear upshot of her causal model is that the structure of chemical reactions, as discovered in the recent chemical revolution, is the standard case of causation rather than an anomaly.

4.4 *A chemical model of causation*

It is worth noting that Shepherd did not think of chemistry as a separate field of study from physics. In EPEU, she talks about physical laws as 'all the general laws as they are called of physical attributes, **whether mechanical or chemical...**' (EPEU 360; emphasis added). In Shepherd's time it would not have been obvious whether chemical processes were more fundamental than mechanical ones: recall Whewell's claim that chemistry promised to reveal the 'inmost constitution' of 'all substances' (Whewell 1837/2010). This raises the question: why does Shepherd not name known chemical substances in the presentation of her theory?⁴⁹ Why does she describe combustion as the union of *fire and wood* rather than *oxygen and fuel* (ERCE 57)? First, she is theorizing at a much greater level of generality. Her theory is supposed to describe ordinary empirical reasoning, and there is no need to understand the nature of oxygen in order to reason about the known qualities of fire. Second, she is not interested in a causal theory that only applies to the chemists of her time. Instead, Shepherd aims at a general theory of causation that could apply to any future scientific discovery. What is important to Shepherd is that every entity must have *qualities*, which are understood in terms of causal powers or capacities to produce effects (ERCE 46; 53-55). This concept can include all the causal information of an *elective affinity*, but it is less restrictive. A quality could be either universal or elective: it could be a capacity to react when uniting with any massive object, or only when uniting with (say) nitrogen. The term can thus apply to both mechanical and chemical processes, as well as any other causal powers we may discover scientifically.

Shepherd's theory constitutes a 'chemical model' of causation. Her causal theory was written in the aftermath of the chemical revolution. Both Shepherd and her contemporaries were familiar with the tools of practicing chemists and with the conceptual scheme of the chemical philosophy. Her causal model is based on the union of pre-existing objects to produce new qualities, which her readers would have understood as a reference to the practice of chemistry. The first example she gives of these unions is combustion. By using this example, she is signaling that her causal model is meant to accommodate the leading account of combustion

⁴⁹ She does refer to some compounds, like oxalic acid, as illustrative examples (ERCE 104).

based on Lavoisier’s theory of oxygen. Shepherd’s attitude toward chemistry is consistent with a 19th century emergentist outlook, which sees the incorporation of chemical causation as a central question in the foundations of science.

SECTION 5: THE SPECIAL SCIENCES

Chemical discoveries in the late 18th century posed a sharp problem for mechanistic reductionism. But chemistry is only one example of the broader problem of incorporating the special sciences into our conception of scientific research. Shepherd lived through a process of fragmentation that led to the crystallization of a number of special scientific fields. This process was widely noticed by scientists and philosophers of Shepherd’s time. William Whewell describes this fragmentation in 1834:

The tendency of the sciences has long been an increasing proclivity of separation and dismemberment... the disintegration goes on, like that of a great empire falling to pieces; physical science itself is endlessly subdivided, and the subdivisions insulated... The mathematician turns away from the chemist; the chemist from the naturalist ... And thus science, even mere physical science, loses all traces of unity. (Whewell 1834: 58-9)

Shepherd did not just happen to live through this period of fragmentation. She interacted with various pioneers of the special sciences, including computer scientist Charles Babbage, economist David Ricardo, biologist William Lawrence, political economist Thomas Malthus, and geologist Charles Lyell (Brandreth 1886).⁵⁰ Most of these pioneers were regular attendees at Shepherd’s intellectual banquets, where she was known for engaging in detailed discussions with her guests about their areas of expertise.⁵¹

Although we do not have any of Shepherd’s writing from before the publication of ERCE in 1824, we can infer that she was familiar with developments in the special sciences long before this. For example, a letter from British writer Amelia Opie places Shepherd at a dinner party in June 1814 with other prominent intellectuals. After dinner Shepherd entered into a discussion with Johann Spurzheim - brain scientist and popularizer of phrenology - in which she “threw down the gauntlet,” challenging his views and displaying that she was as knowledgeable on cutting-edge brain science ‘as any professor could have been.’

...the wonder of the crowd, and the persons who sucked us all in turn into their vortex, were Professor Spurzheim and Lady M. Shepherd. Her ladyship fairly threw down the gauntlet, and was as luminous, as deep, as clever in her observations and questions, and her display of previous knowledge of Gall’s theory and Hartley’s,⁵² as any professor

⁵⁰ Shepherd closely followed developments in these special sciences, writing to Babbage in 1833 that she had ‘studied so much’ of Lyell’s *Principles of Geology* that ‘all he said was quite familiar to me.’ (Garrett 2024: Letter 4). On Shepherd’s connections to intellectuals of her time, see (McRobert 2014).

⁵¹ Harriet Martineau reports being ‘made to undergo, for her satisfaction, a most ludicrous examination by Lady Mary, about how I wrote my Series, and what I thought of it’ (Martineau 1877: 384).

⁵² Gall was Spurzheim’s mentor and the originator of the phrenological ideas that Spurzheim popularized (Zola-

could have been, and convinced *me*, at least, that when Mr. Tierney said, of Lady Mary, she was almost the best metaphysician he ever knew, and the most logical woman, *by far*, he ever met with, he was probably *right*. The professor looked alarmed, and put on his pins; and Lady Mary began her dialogue at ten, and it was not over at a little past twelve. (Opie 1854: 151)

This letter predates the publication of ERCE by 10 years. Already at this time Shepherd was confidently engaging in an hours-long debate with someone who would have then been considered a world-leading authority on brain science.⁵³ When Shepherd later writes that ‘a different action of the brain is wanted for *each variety of thought and sensation*’ (ERCE 171), she is basing this opinion on decades of following the burgeoning research on brain science that was developing throughout her life. Shepherd was clearly aware of developments in the study of the brain and its relation to cognition, and she had studied the most recent and significant scientific publications on the topic. This indicates that she had a deeper understanding of special scientific developments than she displays in her published works.

The reported quote from Tierney, a prominent Whig politician, implies that Shepherd’s 1814 conversation with Spurzheim was not a rare occurrence. This indicates the rigor and depth of the conversations she had with the London intelligentsia on other occasions, such as the banquets she organized, which we know preceded the publication of ERCE in 1824 because David Ricardo attended them before his early death in 1823 (Brandreth 1886). Any scientist attending Lady Mary Shepherd’s banquets would have been prepared for a serious conversation about their research. We can thus infer that Shepherd was aware of the progress of new special scientific fields. This experience undoubtedly informed her development of a unified conception of scientific research on the basis of her chemical model of causation.

SECTION 6: IS SHEPHERD THE FIRST BRITISH EMERGENTIST?

I have argued that Shepherd’s causal theory addresses the central concern that motivated 19th century emergentism: how the novel phenomena studied by the special sciences arise from interactions of more basic constituents. But we must distinguish Shepherd’s approach to the relation of emergence from that of John Stuart Mill and the British Emergentists that followed him. First, Mill and his followers draw a sharp distinction between two types of effects: one type results from standard mechanical interactions, and the other is exemplified by chemical reactions and other special scientific phenomena.⁵⁴ Shepherd, on the other hand, has a unified conception of the causal relation that covers all causal interactions under her chemical model. She makes no

Morgan 1995); Hartley had published an influential work on the science of mind in the late 18th century.

⁵³ Spurzheim was in London as part of his world-wide series of lectures and public dissections of brains. While the phrenology of Spurzheim and his mentor Gall has been discredited, their empirical research in neuroanatomy was instrumental for later discoveries in brain science (Simpson 2005).

⁵⁴ (Mill 1843/1974: 372) claims that chemical reactions involve ‘heteropathic laws,’ differentiating them from the ‘homopathic’ laws governing mechanical causation; (Lewes 1877) maintains this distinction, introducing the terms ‘emergent’ and ‘resultant.’

distinction between purely mechanical interactions and those we find in chemistry, biology, or psychology: they all share the same formal structure, and inferences in all of these areas follow the same rules (EPEU 290). Second, Shepherd claims that there is a logical connection between the nature of a cause and its effect, so that it would be a contradiction for like causes to produce different effects (ERCE 72). This is simply not how Mill or his followers thought about emergence. For them, it was important that an emergent entity's behavior had no logical connection to the underlying behavior of its base.⁵⁵

For these reasons, I do not find it appropriate to group Shepherd with the British Emergentist tradition in philosophy. That tradition is correctly said to begin with Mill's analysis of chemical and biological causation in *A System of Logic*. There is no reason to think Mill had read Shepherd, and her works were long out of print by the time the later British Emergentists picked up on Mill's ideas decades later.⁵⁶ Shepherd developed an emergentist system as a response to the central problems raised by the science of her time, much like the British Emergentists. But the two did not produce the same solution to these problems. Their two approaches also differ on foundational metaphysical questions: Mill's causal theory was heavily influenced by Hume,⁵⁷ while in the subtitle of ERCE Shepherd says she is 'controverting the doctrine of Mr. Hume.' Shepherd's notion of emergence may be more closely related to later emergentist theorizing, such as the surge of emergentism among scientists following Anderson's 1972 *More is Different*, though more work needs to be done to understand these similarities.⁵⁸

CONCLUSION

I have highlighted several points of convergence between Shepherd's views and those of emergentists. In my view, the best explanation for this convergence is that Shepherd is engaged in an emergentist project. She faced the same scientific context that gave rise to Mill's emergentism only two decades later. Her causal theory accommodates the known structure of chemical reactions by parting ways with a purely mechanistic worldview. She shares the emergentist aim of providing a unified account of scientific inquiry while maintaining the autonomy of sciences that study higher-level phenomena like organisms and minds. She believes effects are *new natures*, yet they supervene and synchronically depend on the mixture of constituents that produce them. This is enough evidence to support an emergentist interpretation of Shepherd's metaphysical project.

Since Shepherd published ERCE nearly twenty years before Mill's *A System of Logic*, this may mean she is the earliest modern metaphysician attempting to work out a theory of

⁵⁵ Partly for this reason, their notion of emergence is typically grouped into the category of *strong emergence*, which sees emergent behavior as governed by fundamentally distinct laws that do not apply at any lower level (McLaughlin, (McLaughlin 1992; Wilson 2016). Shepherd's disagreements with the British Emergentists may indicate that she is best understood as a *weak* emergentist, though I cannot fully address this distinction in the scope of this essay.

⁵⁶ (Garrett 2024: Letter 12).

⁵⁷ For Mill's Humean metaphysics of causation see Book III, Chapter V, Section 2 of *A System of Logic*.

⁵⁸ (Anderson 1972; Anderson and Stein 1987; Laughlin and Pines 2000; Bedau 1997).

emergence.⁵⁹ Moreover, Shepherd’s unified conception of causation entails that the *only* metaphysical relations we discover through scientific research are synchronic dependence relations holding between emergent entities and their constituents. I know of no other emergentist that has defended this position. Shepherd contends that this revisionary conception of causation can undermine Hume’s arguments against causal realism. Her project should thus be of interest to both current emergentists and to anyone involved in debates about Humeanism in the philosophy of science.

There is much more to say about the details of Shepherd’s emergentist model of causation than I have articulated in this essay. First, under what conditions does a quality count as a ‘new nature’? Second, how does this picture of the causal relation interact with Shepherd’s views on causal reasoning and perception, such that we are able to grasp inter-level dependence relations through scientific investigation? The answers to these questions depend on issues that are beyond the scope of this essay (such as whether Shepherd’s causal theory resembles *strong* or *weak* emergence).⁶⁰ The foregoing analysis is therefore only a first step to understanding the emergentist implications of Shepherd’s metaphysics. The historical and philosophical similarities between her and the emergentist tradition make it clear that this is a worthwhile research direction that can help us better understand Shepherd’s work in its historical context. This analysis may also improve our understanding of the foundations and motivations of emergentism, which remains a live philosophical tradition in the 21st century. Just as British Emergentism has served as inspiration for contemporary emergentists,⁶¹ Shepherd merits our attention as an early adopter of an emergentist approach to thinking about causation, metaphysical dependence, and the foundations of science.⁶²

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⁵⁹ I say *modern* because there is some evidence that emergence was theorized in the ancient world, for example by Galen (Kim 1999: 33 note 3) and by Bṛhaspati and his Cārvāka followers in Classical India (Ganeri 2012).

⁶⁰ On the strong/weak emergence distinction, see (Bedau 2002; Chalmers 2006; Wilson 2016, 2021).

⁶¹ (Zangwill 2021; Chalmers 2006).

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