

## Introduction

The following essay is a part of a larger project on emergence theory. It explores a process of determination, *self*-determination, and how it can explain growth and alteration of entities described as emergent. The first step, prior to addressing emergence theory, is to establish whether there is a way of thinking about determination which yields a coherent concept of self-determination. §1 fulfills this requirement through gaining foothold on the concept of determination along with the supporting notion of mediation, within Hegel's knotty logical work on the subject. While some may see having recourse to Hegel as unfortunate, its notoriously methodical program serves to limit the ontic baggage associated with such a loaded term as "determination." In doing so §1 strives to untangle the interconnecting influences of the self-oriented process of self-determination and the role of the "other" on the "self" that will be shown to spark the self-deterministic process. To recognize the process as validly generative, self-determination cannot become a process of isolation, or it runs the risk of generating completely independent self-enclosed substances, infinitely morphing and completely unstable. Balance between the self-propelling process of self-determination and the other-oriented nature (and possible causal influence) of outward determination is critical, and this balance is reflected in Hegel's program of determination. Yet in doing so, it still allows self-driven determination preventing a collapse to the merely externally oriented variation of the concept.

§2 applies this ontologically derived self-determination in substance oriented emergence theory. It is an Aristotelian reformulation of the emergence concept that the overall project alluded to above seeks to build, and it is in this conception of emergence theory the self-

determination of §1 demonstrates its power as an explanatory tool. It gives insight into the inner workings of the alteration of an emergent entity in its accidental *and* essential characteristics in a self-oriented development which is still keyed and to some degree regulated by an exogenetic processes. Thus the emergent entity falls neither into the trap of unceasing flux nor complete determination by the other without the internal elements that define the substance as an emergent entity. In order to develop the line of thought above this paper draws on Hegel and Aristotle in terms of the problematic, specifically in terms of substance ontology.

### § I: Determination and Self-Determination

Exploring whether self-determination is a coherent concept entails finding what “determination” and thus “self-determination” are to begin with. Many philosophers have their own definition and it may be something of a cliché, but determination is said in many ways and it is important to narrow the arena of inquiry. Thus while it is applied to, for example, the theory of free will, and while it is a key element of political science and the concept of self-rule, for this effort the essay is focusing its efforts on a metaphysical and ontological purview. Even within this more restricted realm of discourse there is quite a bit of room for equivocal usage, as an example the “Internet Encyclopedia of Philosophy [IEP]” in an article entitled “Supervenience and Determination” uses the following definition for determination: “B determines A just in case sameness with respect to B implies sameness with respect to A<sup>1</sup>.” The use of implication is the most glaring issue with this definition as it renders any causal link in determination extremely weak. Thus any active interconnection between B and A is left muddled, and *this* leaves open

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<sup>1</sup> Note that unlike Hegel, the author does not attempt to differentiate between determinateness and determination. <http://www.iep.utm.edu/superven/>

quite a few other possibilities; there might be some other element C, for example, which determines both B and A. The emergence theorist is drawn into a search for a more satisfying understanding of determination, and in doing so quickly strays into Hegel's domain.

Hegel's understanding of determination is characteristically complex and it is only careful analysis that one can parse out the sort of determination which is open to the self-determination required for emergence theory. In both the *Logic* and *Encyclopedia Logic* Hegel systematically builds to "determination as such," *Bestimmtheit*, and along with it "determinate being," *Dasein*. He explores the way in which the determinacy of a being, as a merger of only Being and Nothing unfolds itself into a particular negation of *other* in a manner which reveals itself to be a specific *Bestimmtheit*. As Houlgate explains in his *The Opening of Hegel's Logic*: "Determinateness, [*Bestimmtheit*], is simply the moment of "nonbeing" (*Nichtsein*) that renders all being stable and definite. By contrast, determination [*Bestimmung*] is considerably more complex."<sup>2</sup> Our interest in self-determination must needs orient us towards the process of *Bestimmung* in order to trace if Hegel's understanding of determination lends itself to a process useful in emergence theory. To gain an insight into Hegel's conception of both determination and mediation the essay will utilize both the *Logic* and the *Encyclopedia Logic* in a small exposition of the progression of his logic beginning with Quality.

Quality, as defined in the *Encyclopedia Logic* §89 and 90, is determination seemingly independent of mediation, the prime outcome of Becoming, "*Being-there* is being with a *determinacy* that is [given] as immediate determinacy or as determinacy that [simply] is: *quality*."<sup>3</sup> This "being-there" is the outcome of the logical folding into each other of Being and Nothing: "because of its contradiction becoming collapses inwardly into the unity within which

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<sup>2</sup> Houlgate p.348

<sup>3</sup> Encyclopedia Logic p.146

both are sublated; in this way its *result* is *being-there*.<sup>4</sup> This sublation, however, must be a mediation as there can be no advance with pure immediacy: “being-there is the unity of being and nothing, in which the *immediacy* of these determinations, and therewith their contradiction, has disappeared in their relation [emphasis added].<sup>5</sup>” The determination of being-there is immediate as it has no mediating other, it simply *is* a nothing that contains being and being that contains nothing but that being and nothing, in being related to each other have canceled the very immediacy that made them what they were. There has been a mediating ground to this immediate determinacy of being-there, but it itself has not yet been mediated or further determined. The reader can thus see a problem with the Zusatz for §90 which states “quality is, in general, the determinacy that is immediate, identical with being...Something is what it is by virtue of its quality, if it loses its quality it ceases to be what it is,<sup>6</sup>” which sounds similar to Aristotle’s essential properties. Hegel, however, is not so straightforward; instead he seems to be talking about sheer or pure qualitativness as such. From Winfield’s lectures on the *Logic*, “Here we are not talking about *a* quality, about any specific feature or property or anything of that sort. We are just addressing quality as such.<sup>7</sup>” This is the initial determination, the logical step that gives a concrecence to the flux of Becoming, in other words while Being and Nothing are true abstractions; they enter the world is through quality whose negative term is “limit.” They unify in being what it is to be a limit, while remaining completely opposite. Yet the Zusätze would seem to point to a more Aristotelian viewpoint. The distinction is not inconsequential; the quality which results from self-determination, which is the explanatory goal of this whole effort, is much less abstract than quality as such. One could understand the admixture of Being and Nothing into

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<sup>4</sup> Encyclopedia Logic p.145

<sup>5</sup> Encyclopedia Logic p.146

<sup>6</sup> Ibid.

<sup>7</sup> Winfield p.71

being-there as the primary determination which leads to self (somewhat down the line), but in Hegelian terms this is presuming the category of self or “Something,” when there is only as of yet quality as such. Hegel himself finally undermines the *Zusätze* in the *Logic*, “Determinateness thus isolated by itself, as *existent* determinateness, is *quality*-something totally simple, immediate.<sup>8</sup>” This may not be the determination looked for in attempting to understand substantial change of emergent substances. Nonetheless, limitation is the primary negative determination of quality, and it is the precursor of both form and composition so important to the substantial worldview<sup>9</sup>. In this way quality points the way to identity, essence, and substance. It is the “being-there” which is the single determination of limitedness (with its built-in combination of being and negation) as stated in the *Encyclopedia*: “In being-there the determinacy...is *limit, restriction*.<sup>10</sup>” In the *Logic* quality is the first determination of the unmediated abstracts Being and Nothing as they relate to the world as “an existence.” The split way in which quality relates to Being and Nothing is made explicit: “Quality, in the distinct value of *existent*, is *reality*; when affected by a negating, it is *negation* in general, still a quality but one that counts as a lack and is further determined as limit, restriction.<sup>11</sup>” These are the two sides of what it is to be limited existence, and their interrelated interaction is the direct way in which the too-abstract concepts of pure Being and Nothing are in the world itself. One encounters quality, positive and negative, as the point of separation that allows a thing to be a thing (although not yet any specific thing), and it is why the category of “something” is the logical consequence of quality as such. In allowing limitation and thus separation it is the direct precursor to “being-for-another” and “being-for-itself” because it is the foundation for separation

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<sup>8</sup> *Logic* p.85

<sup>9</sup> Limit is the necessary starting point for form and thus composition.

<sup>10</sup> *Encyclopedia Logic* p.14

<sup>11</sup> *Logic* p.86

between self and other. This may be what the *Zusätze* was attempting to point out, nonetheless, the author seems to have skipped a category, a suspicion which the *Logic* supports, where quality (“something totally simple, immediate<sup>12</sup>”) logically precedes the conceptually independent and distinct “something.” Mere limitation must fall into the determination of form before essence can have meaning, and abstract quality is still too indeterminate. That which makes a thing *what-it-is* is more concrete, and is what falls out of form, which is itself a further determination on the abstract limit of quality per se. Since essential properties are, as will be shown later, open to self-powered alteration there is now a target in this exposition of Hegel. In order to have such determined determinations as is implied by the *Zusätz*’s version of “quality” there is necessarily an *other* to which this determination is presented, although the determination is part of the “in-itself” of that in which it is made explicit. As Hegel himself states in the logic: “Quality specifically is a *property* only when, in an *external connection*, it manifests itself as an *immanent determination*.<sup>13</sup>” In other words there must be a sense of limit and separation (functions of the negation implicit in the determination of quality), or the quality loses its meaning and falls into the indeterminateness of Being. This split between self and other is a *consequence* of the limitedness brought on by Quality, by which division yields an identifiable something, which is determined only in not being the other, “what has changed is the *other*, it becomes the *other* of the *other*”<sup>14</sup>. In this way being is reestablished, but as negation of the negation. It is now *being-for-itself*.<sup>15</sup> Now with the other as opposed to the self, there finally exists the possibility of essence and mediated determinations. These are the determinations that are open to self-determination, since there was previously no concept of “self.” Finally, and most importantly for

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<sup>12</sup> Logic p.85

<sup>13</sup> Logic p.88

<sup>14</sup> A consequence of this otherness is quantity, which is Hegel’s next explanatory focus.

<sup>15</sup> Encyclopedia Logic p. 151

our effort here, this being-there, a.k.a. quality, is, as a part of its integration into the “in-itself,” alterable and *self*-alterable: “this alterability of being-there appears in our representation as a mere possibility, whose realization is not grounded within being-there itself [i.e. the quality *itself* is not the source or locus of alteration]. In fact, however, self-alteration is involved in the concept of being-there, and is only the manifestation of what being-there is in-itself.<sup>16</sup>” The manner in which the essence embodies itself as a result of “being-there [i.e. quality]...in-itself” gives the possibility of its own essential transformation; it is worth remembering at this point that Hegel has not discussed essence, so too this is making a bit of a jump. None the less we see the necessary fact of transformation being integral to the very embodiment of quality itself. Not that we are to leave everything unstable, however, Hegel himself cautions of the danger implicit in any theory allowing for self-alteration, a warning mirroring the one given above, namely that such a theory could open the door for beings infinitely in flux. “Something becomes an other, but the other is itself a something, so it likewise becomes an other, and so on *ad infinitum*...This infinity is *spurious or negative* infinity, since it is nothing but the negation of the finite, but the finite arises again in the same way.<sup>17</sup>” This runaway reaction comes from not placing proper emphasis on either the “self” or the “other” and attempting to only use one half of the dialectic that is limit or boundary. By essentializing either concept without taking into account the other, infinite and unwarranted flux arises. Our emergent determinations, then, must take into account this balance, even while framing them as *self*-determinations.

We will follow Hegel through one more step of his logical progression (from quality to thing-hood) in order to tease out something more about what determination is, and to get a grasp of the important concept of mediation. “Something” is pre-essential existence, no longer a

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<sup>16</sup> Encyclopedia Logic p.149

<sup>17</sup> Ibid.

vague abstraction as Being or Nothing, rather it is identity in itself, without further determination. “*Something* is an *existent* as the negation of negation, for such a negation is the restoration of the simple reference to itself-but the something is thereby equally the *mediation of itself with itself*.”<sup>18</sup> More than that, it is “*posited* in the something in so far as the latter is determined as a simple *identity*.”<sup>19</sup> As such, the concept of “something” referenced here is akin to having someone pointing out an object behind one, before one turns around to see what it is. Of course this analogy is inexact in that “something” is separate from any *specific* identity but it gives an idea of what the *Logic* is discussing. Unlike in the discussion of quality just now where self-impelled change yielded a bad infinite, here self-mediation is way the in which something is existent. It is the *mediation* that is self-oriented, not the determination which Hegel, following Spinoza, views as inherently a negation. Thus in *Encyclopedia*, the still-abstract “something” negates itself to yield the only other possible: something else, but this the negative infinite noted above. There is no return to pure Nothing in the abstract sense as has sublated into Becoming through its opposition to Being; thus all that is left is another something. The problem is that the something has not in any way been *determined* beyond Qualitativeness (that is limitedness), so when “something” negates itself to “something else” there cannot yet be any distinction between the two except a something that negates itself in trying to self-determine. Thus a red queen situation emerges: endlessly running in place and going nowhere, incessantly negating something and in so doing returning back to our starting point<sup>20</sup>. In *Logic*, however, the “something” does not determine; rather, it mediates itself. This would seem a powerful differentiation, but Hegel

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<sup>18</sup> *Logic* p.89

<sup>19</sup> *Ibid*.

<sup>20</sup> Hegel isn't mentioning this cycle needlessly, he has two reasons to discuss it, firstly to draw our attention to what he views as a common mistake: the misuse of a cyclically progressive infinite as important: “It is of great importance to grasp the concept of true Infinity in an adequate way, and not just stop at the spurious infinity of the infinite progress.” (*Encyclopedia* p. 149) Secondly it gives us a route to get to the true infinity we desire: “this infinity expresses only the requirement that the finite *ought* to be sublated.” (*Encyclopedia* p. 149)



leaves us with this frustrating note: “Attention can be drawn to the presence of mediation in general, as against the principle of the alleged bare immediacy of a knowledge from which mediation should be excluded. But there is no further need to draw particular attention to the moment of mediation, since it is to be found everywhere and on all sides, in every concept.”<sup>21</sup> It would seem that as the mediation-determination link approaches, a link promising to be usable in a theoretical framework such as emergence, Hegel leaves us to our own devices. Mediation is fundamentally important to determination and is capable of self-reflection when determination itself is not,<sup>22</sup> but in tying it so closely to the progression of logic Hegel finds an *aporia* when trying to pull mediation out of the purely immediate world of Being and Nothing. Ultimately our interest is in the possibility of self-determination of emergent substances, how pure Being becomes mediated seems a bit off track. However the progression that has been seen through Hegel has shown us firstly that determination is the key ontic driver for understanding how Being actualizes itself in the world, and secondly that mediation is vitally important to this process; it is “everywhere and on all sides.” Attempting to plug the hole that seems to appear in Hegel’s work is certainly outside the bounds of this paper, nonetheless the self-reflexive capability of mediation makes it an important consideration thanks to the necessarily self-reflective nature of emergent substances.

As there must be a usable set of definitions in hand before progressing, this effort will end with these. Mediation is similar to the middle term of Aristotle, but with more flexibility. Mediation is a connection between two entities which involves a passing through, a subtle alteration that at the very least filters the entity through the “lens” of the form of the

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<sup>21</sup> Logic p.89

<sup>22</sup> Note that determination will become capable of self-reflection in later discussions of Essence and Ground (see Logic p. 386), it does not, however, yet have that capability at this point of abstraction.

interconnection. An entity subject to mediation is concrete enough to be open to interconnection and as such not featureless. Hegel's Being and Nothing as purely abstract *must* be entirely immediate, a necessity which spurs his concern about the rise of mediation from the purely immediate. The relation that is mediation can be a one of action (positing) identifying through negation (determining-especially through the flux of becoming) or a non-active a formal interconnection although at times the form is only one of identity. Thus Hegel can state "Essence-as Being that mediates itself with itself through its own negativity-is relation to itself only by being relation to another; but this other is immediately, not as what *is* but as *something-positing* and *mediated*."<sup>23</sup> The mediation serves to ground Being in something and the middle mediating term is negativity that is abstract Quality i.e. limit.<sup>24</sup> But this is not the only mediation occurring in this passage. The "other" gives the self-reference to itself through being its negative: through *not* being the self. In order to do this, however, the "other" has to have its separation from the "self." In other words the "other" has been posited outside (as negative to) the "self" which requires a mediation through the "self" to gain this negativity. This bi-directionality in mediation of essence will become a key aspect of how the parts of the emergent substance relate to the whole, especially through the process of a determination. Finally the definition of determination: determination is a mediated concreteness,<sup>25</sup> or, if following along with *omnis determinatio est negatio*, the act of determination serves as a negation of abstractness. In a parallel way, determination is an actualization of potential thereby negating possibilities of other elements of the potentiality. For example if something has the potential to grow, its growth

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<sup>23</sup> Encyclopedia p. 175

<sup>24</sup> Note that I am using this definition of essence as an example of the complexity of how mediation is used, essence for Hegel is another complex concept, and not always a stable one. See Winfield's *Hegel's Science of Logic* p.155

<sup>25</sup> This mediation may be through our cognition in which case the determination is one of intelligibility as for example when our measurement of a quantum system collapses the wave function of a particle into a position, or when we engineer or design something.

negates the possible outcome of it *not* growing (or growing in some other manner) as an element of the potential. A determination requires a causal source, be it form, material, etc. whereas mediation grounds cause by setting up the interrelation between the causally active elements.<sup>26</sup> Such determinations can be self-reflexive in several ways without falling into the trap of infinite flux: they can be self-mediated, self-caused, or the nature of the specific determination can be inwardly derived. In terms of activity, a self-determination is when a substance or its parts in their existence as proper parts undergo a determination in which they serve as the primary mediator, cause, or when they are the cause of the determination's being what it is. The emergent substance's part/whole relation is open to most of these aspects of self-determination. These definitions for mediation and determination may not map precisely onto Hegel's usage (especially later in *Logic*), but they are useful for this project here, and so this endeavor will use these formulations.

Now with the definitions of determination and mediation to work with, we must identify the elements of substance open to such self-determination. In other words, what it is that has been determined if a substance is subject to such a determination. Essential and nonessential properties<sup>27</sup> present themselves as immediate options, although it is possible that neither or both categories are proper targets. Aristotle is the primary grounding source of substance and essence used as conceptual foundations in this formulation of emergence theory. For him essence is the purview of primary substances, only "*a what-it-was-to-be-that-thing only belongs to those things for whom an account is just a definition.*"<sup>28</sup> For an emergent entity it means that if one is to

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<sup>26</sup> For example if one thought causally leads to another there is mediation through the mind and mental states which allows that causal interaction to occur. Also note that mediation may not be grounding any cause but may be a mere relational interconnection whereby they mediate each other in terms of what they are.

<sup>27</sup> I use the term with some hesitation, "property" is often a misused term in emergence theory, one which is used as the outcome of emergence, e.g. that which emerges. Here, however, we are discussing determinations of emergent entities, not emergence *per se* so I feel I can use the term for clarity's sake.

<sup>28</sup> Aristotle Metaphysics p.179 [1030a]

accept its properties as beyond merely accidental one must understand that entity as a unified “this,” not some kind of amalgamation of parts. This is something of a departure from most modern of emergence theory which relies on novel but accidental properties. A note of reductionism remains in this view under which novel properties emerge as complexity increases, but it is a new property of the collection of parts, another item on the heap of properties and there is not a new thing to which properties are ascribed. If pressed to locate the substance they must either deny its existence, yielding a “thingless” universe, or maintain a deep dive into the most basic elements of matter (bosons, or superstrings if the theorist leans towards string theory). While there is something to be said for the uniqueness of fundamental non-composite substances, retaining them as the *only* substances on which layer after layer of properties pile themselves misses the most central tenant of emergence theory. Connecting emergence theory to Aristotelian substance yields a nice harmony: on the one hand there is the theory with an historical and metaphysical grounding, and on the other there is an ontologically stable rationale for separating genuine substances (entities with emergent essences) from compounds (those entities whose qualities are summative rather than emergent).<sup>29</sup>

## § II: Emergent Substances and Self-Determination

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<sup>29</sup> Determination and mediation are inseparable in the Hegelian sense, something is determined through its mediation by an other through which it reflects (maps the process of how it is specifying) itself into itself. Mediation is defined as the bringing together of two opposing elements through the effort of a third term which serves to catalyze the otherwise impossible process. To say that determination is impossible without mediation means that the process by which something goes from indeterminate to determinate (two opposite concepts) or gets reconfigured from one determination to another requires a third term. In the move from Quality to something there cannot yet be an outer beyond the being and nothing that have determined each other already, so the third term must be contained within this being-there to be further determined as being-for-itself.

There are now almost all the pieces required to explore the self-determining process of emergent substances; all that is needed is a solid grasp of physical “emergent substance.” One can explain substance itself in Aristotelian terms as a primary substance replete with specific essence. The factor of emergence engenders a new and far more expansively interconnected view of the universe. Something is said to be “emergent” if its essence is categorically different from both the essence and the nonessential properties of its constituents. But it exists as what it is only in virtue of those constituents being its proper parts with their respective essence and properties.<sup>30</sup> The relation between the proper parts constitutes the formal cause of the higher level substance. Thus the supervening substance maintains its distinction as categorically other than an additive collection of properties of the substances below: it is unique and its coming-into-being is truly generative.<sup>31</sup> The component parts and the nature of those parts dictate the array of possible forms that cause the essence of the supervenient substance. The higher-level substance is thus never causally divorced from its components’ essences. This inter-level relationship is a form of the Hegelian mediation discussed previously with a twist: the essence of the higher level is the “Being that mediates itself with itself through its own negativity.”<sup>32</sup> By the same passage, however, essence is additionally “relation to itself only by being relation to another,”<sup>33</sup> in this case the “other” is the very component substance that make up the structure of the higher level substance. These lower level substances are separate enough to give an other

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<sup>30</sup> The essence and properties determine what relations are possible, thus what emergent substances can supervene.

<sup>31</sup> The process of original coming to be is connected to the process of self-determination described here, but occurs when the form becomes so altered, perhaps by the inclusion or subsuming of an outside substance, that it has gained an entirely unique essence. Like the process here, it is continuous, and the new is a stretching and repurposing of the old.

<sup>32</sup> Encyclopedia p.175

<sup>33</sup> Ibid.

against which to stand in opposition (each being categorically not the other), but *necessarily* the two substances posit<sup>34</sup> and mediate each other each through its own lens.

At some point in this discussion an old concern arises: at what point does a structure of components become a new substance? The categorical bias of coherent thinking often impels us to sharply delineate substances of a certain complexity (e.g. a protein) with a specific essence based on its structure. Nonetheless, the limits of substance (the lower and upper complexity “bound”), unlike its categorical definition, can be fuzzy. One can define a protein as a molecule with at least one polypeptide, a very useful definition for biochemists, but a metaphysically arbitrary definition. If the protein is a part of a cell membrane can one legitimately abstract the protein as itself “a substance”? I believe one can, but with a qualifier: one isolates the protein only because it has a unique essence shared by neither the membrane, nor the atoms composing the protein. It exists, however, within an extended continuum from the fundamental particle-first intelligible substance-to universe.<sup>35</sup> The manner in which a substance is identified parallels the way in which one identifies a number in a number line; while one can isolate the number five, it is only defined by<sup>36</sup> relational terms within the number line. The mistake comes in thinking that this somehow invalidates the five-ness of five as unique.<sup>37</sup> Isolating an individual substance is definitely a valid speculative move.<sup>38</sup> Nonetheless there needs to be caution lest abstraction

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<sup>34</sup> This “form” is a dynamically forming steady state, happenings rather than static structure.

<sup>35</sup> I am explicitly placing this in terms of the physical sciences, however Aristotle would have identified the basic element as prime matter. Others, notably Whitehead, would use an active event or occasion. The nature of the foundational element, either substance or otherwise, is a topic of further research, but is not key here.

<sup>36</sup> This is a unique element of number, substances are not defined by their location while numbers’ location *is* their form.

<sup>37</sup> Like the emergent substance, the quantization of a number is a half-truth generated by our format of learning numbers primarily from counting. In fact the number line is a truer continuum than any in the realm of space-time.

<sup>38</sup> In a certain sense it is Lotzian: “content [of ideas] on the other hand, so far as we regard it in abstraction from the mental activity which we direct to it, can no longer be said to occur [that is have the continual Becoming of the activity of thought], though neither again does it exist as things exist; we can only say that it possesses Validity.” (Lotze p. 209)

remove the substance from its generative place in nature. As a visual analogy, imagine a meta-structure of supervening substances graphed in complexity space, a series of pillars starting at fundamental particles and slowly merging into each other as the substances become cooperatively involved in more and more complex forms.<sup>39</sup> There is a sublative aspect to this formation in the manner in which each substance becomes the compositional element of the next in moving up the scale.<sup>40</sup> Each substance is distinct in itself while at the same time it becomes ingredient in actualizing the larger whole; the intelligible boundaries becoming formal characteristics of the supervening more complex substance.<sup>41</sup>

To recur to the definition of the protein, namely one or more polypeptide, it is simultaneously valid and to a degree arbitrary as some proteins are single polypeptides, thus it is unnaturally precise. The definition nonetheless remains applicable and explanatorily useful within the realms of biochemistry. The arbitrary delineation for consciousness (that most iconic of examples in emergence theory), however, is notoriously difficult, in large part because its edges are *not* exact. Is an elephant conscious? Is a sleeper? A dog? There is an entire continuum of consciousness there is real trouble trying to define a sharp edge of for it, like the well-known image of one color slowly morphing into another in which the intermediary steps are unnoticeable although the start and end colors are easily identified as completely different.<sup>42</sup> Nature rarely yields sharp categorial edges, but it *does* present us with the categories themselves:

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<sup>39</sup> The point of merger may be different for different substances, e.g. a hydrogen atom may compose a molecule which is part of a structured crystal and so on, while another hydrogen atom may simply be part of a dust cloud composing a galaxy, things are a bit looser than is suggested by this graphical idea.

<sup>40</sup> This movement is not primarily a spatiotemporal movement, rather it is movement along a spatially graphed degree of freedom. In general going “up” the graph correlates to increased size, but this is accidental and not necessarily true.

<sup>41</sup> Note as well that multiple substances may go into the composition of the next

<sup>42</sup> For an interesting overview of change blindness see <http://nivea.psychu.univ-paris5.fr/ECS/ECS-CB.html>

there *is* a difference called “consciousness” between ourselves and a stone. It is merely that the question “at what point of complexity does consciousness become actual? <sup>43</sup>” is an invalid one.<sup>44</sup>

The main problem with the framework of emergent substance outlined above is that it does not have a solid description of growth and alteration.<sup>45</sup> If forced to fall back onto the concept of matter, either the empirical or Aristotelean, as the sole source of change in emergent substance, the very element of emergence in that substance is lost. This is because the unfortunate theorist must return to the properties of the component parts to explain the essence and properties of the emergent substance: and this way lies reductionism. This is where the self-determination borrowed from Hegel is able to help elucidate the process and resolve the problem.

A substance becomes involved in the self-determination process when one portion of the hierarchical complexity chain of substances is impinged upon from outside. While the determination is self-directed, an other initiates it, otherwise there is nothing to regulate infinite flux and alteration. The other (step 1) provides the impulse that is efficiently causal on the substance. The effect of this cause (step 2) acts downwards to the substrate, mediated through the

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<sup>43</sup> The advent of advanced computation has made the distinction yet more blurry, and reminds us of the formal origin of essence, as opposed to a material one.

<sup>44</sup> There is one striking exception to this: all emergent substances are reliant on the interrelations of its parts. The split between “one” and “many” is the translation that allows a formal relationship, and thus allows emergent essence. This is the categorical point of departure into novelty, beyond that all connections are evolutionary, thus consciousness is an evolutionary alteration to stimulus-response of the most basic of neuronal organisms, but the difference between one neuron and two neurons is infinite. Two neurons can communicate, allow the stimulus-response category to begin. In addition it is only through including more than a singular that we can start to bring in Hegel’s understanding of coming to be of a “something” the multiplicity

<sup>45</sup> They are not parts independently because they as they interact they transcend what they were, going beyond themselves. Components are not inert, they are dynamic and active, they are full substances open to transformation, alteration, and decay both independently and in their formal interactions. Transformation and evolution of the substance is based on the transformative character of substance itself, the movement from component to whole. need a complete definition of what things are involving a complete definition of how things move (in both the physical sense and as change, evolution, or transformation) with respect to itself and other. Until we get a sense of how neurons move, for example, we end up with definitions that are either dualistic with problems defining limits or a physical positivism that misses the sense of what things move for, the source of their motion as final, though not teleological, cause.



higher-level substance, causing a reordering (or some other formal alteration), this is not necessarily a *temporal* sequence as the component parts exist simultaneously with the substance that supervenes on them. Nonetheless, the logical progression continues with this reordering of parts as the nature of the subveniencing substances determines it (step 3). The essence and properties of these parts determine the array of possible arrangements, delineating what bonds or interrelations can form, and how static or fluid they are. In this way the components act as the material cause of alteration in the superveneing substance. The new formation of the substance's component parts becomes the formal cause (step 4) of novel accidental or essential properties as they determine the nature of the substance (step 5) in its being-for-self and its reflection in being-in-other. There are limits to the extent that a substance can determine itself relative to an outside influence. This is important as the self-determination described here, in affecting the form of the substance, can alter the accidental (and importantly) the essential qualities of that substance. Again the limit of this capacity to change is bound in the nature of the interconnections of the components, and too drastic a change will result in the destruction (or complete substantial transformation) of the substance itself.

Hopefully this understanding of self-determination provides a coherent account of growth within the sphere of emergent substances, while doing justice to Hegelian source material. It was my original intention to merely present a picture of growth and alteration of emergent substances, but in discussing the content of this essay at the last APA meeting it was pointed out to me that I might be making a stronger assertion than I had intended. By unintentionally building a universalist vision of emergence, rather than the more typical localized understanding, there is a logic flip between efficient cause and emergence. Instead of an efficient cause having an emergent result, emergence itself is a necessary ground for efficient cause to happen, as such

a cause is level dependent<sup>46</sup>. The nature and consequence of this inversion and whether it holds up to scrutiny, is the subject of further effort in the larger project referenced above, for the time being I hope that this paper will fit a small piece into the larger puzzle that is the emergent world view.

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<sup>46</sup> And grounded through the process of mediation.