

Beyond the Completeness of Physics: A Preliminary Groundwork for a Dispositional
Emergentism

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Abstract

In recent years, the shape of the discourse concerning the structure and subsistence of fundamental properties has taken on new dimensions with respect to their synoptic framing of special science entities. Specifically, challenges to the completeness of physics stemming from evidence of non-linear emergence in the special sciences have attenuated the traditional reliance of accounts of fundamental properties as being derived from a base which takes for granted the fundamentality of physically compatible properties. As such, in the course of this paper, preliminary assumptions from which an account of a monistically dispositional picture of fundamental properties compatible with the non-linear emergent properties evidenced by special science entities might be developed will be explored such that both the dispositional monist program might be salvaged as well a potential basis developed from which non-linear, strongly metaphysically emergent dynamics might be synoptically provided for.

Introduction

The question of the relationship of objects to those various facts which characterize the structure of their properties has stood as among the most persistent, and in no small sense persistently vexing, problems with which metaphysicians have grappled since the birth of the discipline as a formal area of concern. With respect to the dispositional monist conception of fundamental properties, while articulating a largely consistent general program, what exact picture of the structure and ground of dispositions themselves would best account for their putative role in synoptically accounting for natural properties is a itself a vibrantly contested subject of debate. Further in this vein, the question of how both the ground and profile of fundamental properties might best be provided for within a monistically dispositional framework in light of the cutting edge of research within the special sciences, specifically in regard to developments in the mid and higher level sciences, has added a further, deeply challenging dimension to this discourse.

Most acutely, the debate over what the proper basis of a monistically dispositional conception of fundamental properties would consist in has largely turned on what the proper relationship might be of dispositions to the laws of nature, and as to whether or not in fact the the laws of nature have any role at all in accounting for natural properties, with

this question standing in further relation to the role of causation in exhausting the ontological profile of dispositions. More specifically, the degree to which causation depends upon any form of nomological foundation, and conversely whether or not in fact dispositions themselves might provide the foundation of the laws of nature, has occupied much of the traditional heart of the debate over the essence of the dispositionalist program. To this end, the tenability of tethering the profile of dispositions to causation has come under increasing scrutiny in the face of new, ever accumulating evidence regarding the presence of macroscopic ordering relations within nature which exceed the scope of strictly causal relations. Most particularly, evidence of non-linear emergence in the relationship of the macroscopic properties of special science entities to the properties of their composing constituents has challenged the viability of attributing fundamentality to strictly causal relations. This may be taken as the case given that, in structuring the behavior of their composing constituents, such macroscopic properties exert a determining effect upon said constituent particles evidencing a degree of relational complexity which precludes the invocation of strictly efficient causal relations in accounting for the structure and ground of fundamental properties. In view of these considerations, it is this question that forms the core concern of this paper, namely whether or not a dispositional picture of properties can be reconciled with the non-fundamentality of causal relations in view of the structural complexity at play in the relations obtaining between the properties of macroscopic systems and those of their microscopic composing constituents.

To this end, it is in fact explicitly in view of these considerations that I will advocate the indispensability of a monistically dispositional framework in providing an adequate account of nature's fundamental properties. Specifically, given that in acceding to an understanding of nature's structure which posits the fundamentality of structurally macroscopic determining relations over and above any synoptic reliance upon the nature of fundamental properties as deriving their ground in any sense intrinsically, any deference toward properties as obtaining without deference to their relations to other properties becomes therefore moot. As such, in service of this aim, I will advocate in favor of a monistically dispositional picture of properties grounded by an account of the laws of nature which holds LON to be constituted as a matter of restricted metaphysical necessity in the form of structural entailments obtaining in virtue of nature's putatively machretic

constitution. More specifically, this employment of the term machretic draws upon the concept developed in various domains of the special sciences concerned with the non-linear emergent properties of complex macroscopic processes. Most fundamentally, the concept of machretic conditioning accounts for said properties by positing the relationship of macroscopic processes to their composing constituents to consist of non-causal, non-compositional, role shaping determining relations which downwardly condition the collective behaviors of a given system's constituent particles. (Gillett, 2016) As such, in taking on board this view, any conception of the ground of fundamental properties must be taken as essentially subsistent within a mutually interdependent, macroscopic structural ground.

In meeting the previously stated aims, in the course of this paper I will look to develop preliminary assumptions which might underpin a monistically dispositional framework compatible with the picture of nature's nomological constitution advanced by the concept of machretic determination. In so doing, I will first give a cursory overview and critique of two standard-bearing iterations of dispositional monism which exemplify the shortcomings of varieties of this program which accede respectively to the contingency of the laws of nature, in the case of Stephen Mumford's work, and the identity and ground of fundamental properties as being exhausted by their causal profiles as advanced by Alexander Bird. Subsequent to these critiques, I will articulate the fundamentals of machretic determination's alternative conception of nature's nomological structure and its suitability in rectifying the synoptic inadequacies of the preceding frameworks' conceptions of LON. Following from this, I will look to spell-out the rudimentary preliminary structure of machretically grounded monistically dispositional properties in terms of their relationship to the laws of nature and the corresponding nature of the relations through which their manifestation would be derived. Further in this aim, I will explore cases applying this framework to special science entities such that the synoptic potential of such a framework might be satisfactorily illustrated.

Profile of Nomic Contingency

Perhaps the key area of contention between the respective flavors of dispositional monism concerns the precise relationship of dispositions and the laws of nature. Certainly

among the more controversial of the conceits staked in this arena is the claim that the laws of nature are themselves not only non-fundamental, but that whatever ontological role they might have is satisfied and exhausted by the causal role of disposition such that the synoptic necessity of incorporating the laws of nature in our description of the world is therefore moot. To this end, Stephen Mumford, arguably the principal champion of this particular brand of dispositional monism, mounts his central challenge to the utility of the laws of nature in maintaining that, not only are the laws of nature non-essential in accounting for the structure of nature, the very notion of natural laws is itself, if one is to maintain an anti-humean, dispositional essentialist metaphysics, is untenable given that in order for a law to have a governing role with respect to its attendant properties, and therefore in effect relate causally toward them, it must therefore be external to them. As such, by Mumford's lights, if one is to adopt this conceit, one ultimately admits an irresolvable dilemma into one's metaphysics insofar as, if one is to accept the externality of the laws of nature, and thus establish the further dependence of powers upon additional forces, one therefore opens one's metaphysics to the admission of quiddities, the consequence of which being the denial of true fundamentality to dispositional properties. (Mumford, 2004) Furthermore, Mumford argues that the very central commitments of the dispositional essentialist picture of fundamental properties ultimately exhausts the role which the laws of nature would otherwise be expected to play in accounting for the structure of nature. Namely, if one is to adopt the thesis that nature's fundamental properties are ultimately defined by their being disposed with certain powers to effect certain manifestations when entering into certain causal relations, any role which the laws of nature might play in one's ontology is thus effectively usurped by dispositions given that the explanatory powers of the laws of nature in terms of accounting for structural connections in nature are equally well accounted for by the dispositional essences of fundamental properties and the relations obtaining therefrom. As such, Mumford maintains that, if acceding to the account of dispositions as being exhausted by the causal powers they bestow with this therefore accounting for the regularities within nature which natural laws would otherwise be tasked with encompassing, the inclusion of the laws of nature within a dispositional essentialist ontology is therefore both moot and furthermore

ultimately incongruent with the anti-Humean, dispositional essentialist program.
(Mumford, 2004)

In light of the peculiar tenets of Mumford's conception of dispositional essentialism, the lawless dispositional essentialist conceit must be demonstrated to hold congruently against the falsifiable presentation of natural phenomena, or more specifically, Mumford's thesis as to the extraneousness of the laws of nature in accounting for nature's fundamental structure must bear-up against the synoptic requirements of accounting for the in re presentation of natural phenomena. To this end, as to the core stipulation of the ultimate incompatibility of natural laws and the anti-Humean, dispositional monist program, we must first be capable of establishing as satisfactory the conception of dispositional essences as being exhausted in their conferral of causal powers upon their respective properties. As such, in order that Mumford's anti-nomic thesis be maintained, when taking under consideration the manifestation of a given property, the underlying mechanisms which produce its manifestation as such must be capable of being accounted for expressly by the specific power which they're disposed to exhibit to the exclusion of any reliance upon any further putative form of relational property or necessary connection. More specifically, the manifestation of such properties as the redness of a flash of grease igniting in a cooking pan would thus need to be fully accounted for strictly along the lines of the specific disposition toward the presentation of redness by the flash as structurally entailed by the specific powers of the substances at play without any reliance upon antecedent external dependence relations of any kind.

To wit, Mumford's accession to a picture of nature wherein its fundamental structure is identical to the principles and forces which accord with those ultimately exhausted by causation, and thus to the exclusion of any form of higher-order ordering relations and forces, stands as perhaps the most critical pitfall faced by Mumford's program. Among the key sources of this synoptic tension is to be found in the nascent though ever expanding literature engaging with the macroscopic properties of systems, and more specifically, how best to account for the dependency relationship of the properties of the macroscopic relative to those of a respective system's composing constituents. To this end, the difficulty posed in certain cases of establishing a strictly linear relationship between the macroscopic processes and rudimentary composing constituents of certain

systems constitutes the core of the challenge faced by such physically reductive approaches as Mumford's. To this end, such a conceit, it might be well inferred, should be taken as highly suspect as the mere discreteness of any given power in no way implies its independence from a broader structural chain, or for that matter, whether or not the power is itself merely a subsidiary facet of a macroscopic, systematic process, even if such a fact were to run counter to our intuitive perceptions. (Gillett, 2016) More specifically, holding this claim to apply to any apparently discrete property presupposes that in fact the *prima facie* appearance of discreteness is just that, such that is neglected the possibility of any given effect being but the appreciation of one facet of what is in fact a more complex, systematically disposed power. (Gillett, 2016)

A principal example of such cases can be found in the study of population-level adaptive fitness characteristics, prime among these being the eusocial fitness characteristics of ant colonies as studied by the likes of E.O. Wilson. The primary challenge for Mumford's thesis in light of such cases concerns how exactly the proper relationship of the various discrete properties appertaining to the fitness characteristics of ant colonies can be accounted for given that the behavioral inventory of the colony relates in a fundamentally non-linear, macroscopic fashion to the functional attributes of its constituent particles, i.e. the individual ants themselves. Specifically, while the behavior of each individual member of a given colony is observable simply as the individual behavior of a given single agent, the eusocial fitness characteristics which dispose attendant behavioral presentation obtain such they form part of a broader, regular pattern which occurs as a consequence of the dynamics of the colony as a macroscopic system. (Wilson, 1988) More specifically, in instances of the collective problem solving capacities of ant colonies, the clear evidence of collective, self-organizing behavior thus requires accounts which admit of antecedent complex governing mechanisms permitting of the functional interconnections prompting the behavioral output, and thus the attendant determining relations by virtue of which they are underpinned. As such, the functioning of such systems in even the barest of putative senses necessitates accounts which admit of structural dependencies among its various constituent particles given that in the absence of which any description of their behavior would be wholly incoherent. (Wilson, 1988) Taking this as the case, when engaging with phenomena the structure of which cannot be accounted for without taking

for granted the existence of determining dependence relations holding antecedently between otherwise apparently discrete entities, the role of such law-like determining dependence relations and the nomological dynamics appertaining thereto, are thus indispensable in providing synoptic accounts of nature's ontological foundation.

Nomic Necessitarianism and Causal Fundamentality

While themselves positing differing essential relationships between dispositions and the laws of nature, the dominant general orientation within the dispositional essentialist program admits broadly of the fundamental role of the causal profile of properties in filling-out their dispositional characters. Perhaps the principal distinction at play in the specific role which dispositional essentialists ascribe to the laws of nature concerns the determining relationship such as it might be between dispositions and LON, or more specifically, whether it must be held that the laws of nature are necessary in providing for the ground of dispositions or whether in fact dispositions themselves provide the essential ground of the laws of nature, which in turn derive their synoptic necessity in providing for the structure of nature in the form of relations obtaining between the manifestations of different dispositions. In the case of the latter conceit, Alexander Bird's nomic necessitarian dispositional monist framework provides among the more authoritative accounts which admit of the necessity of the laws of nature, providing a reasonable base from which the essential dynamics of a monistically dispositional account of fundamental properties and the laws of nature, such as they might exist, might be accounted for. By the lights of Bird, the laws of nature are to be properly derived from the foundation provided by the powers with which a given fundamental property is endowed, with the laws of nature themselves amounting to both being identical with the powers with which any given property is endowed as well as in less fundamental cases, the relations which obtain necessarily between fundamental properties. (Bird, 2007) More specifically, the laws of nature, by Bird's account, are to be taken as flowing from the causal profile of the potencies which fix the identity of a given property, with the laws of nature in turn being reflective of the dispositional essences of fundamental properties and the relations in which they obtain in virtue of. To this end, Bird holds dispositions to obtain as powers which are in turn given to produce a certain output when entering into particular causal

relationships with other properties, with any property manifestation thus obtaining essentially as a consequence of casual relations. Furthermore, Bird holds fundamental properties, and thus in addition all higher order properties, to be ultimately physically compatible, with all property manifestations being determined by microphysical states of affairs. As such, in the most fundamental sense, the conception of the nomological subsistence of properties advanced by Bird takes as its base a picture of the world whereby nature's ultimate foundation is to be found in the worldview afforded by physicalism, with the most fundamental properties of nature in turn being those which are illuminated by physical phenomena, with all other properties and relations thus obtaining secondarily thereto and with the laws of nature themselves being identical with the causal profile of a given power corresponding to a given physically-grounded property. (Bird, 2007)

In the case of Bird's particular framework, in accounting for the subsistence of dispositions, and in order for Bird's picture of the ground of dispositions to hold, the elemental subsistence of properties and their attendant laws of nature as ascribed by Bird must then be compatible with the essential dynamics observed in the behavioral presentation of special science entities, with the profile corresponding to those properties considered by Bird as fundamental thus requiring a direct analogue in the constitution of nature's fundamental forces. To this end, in Bird's stipulation as to the profile of fundamental properties being exhausted by the causal potencies which they comprise, the picture of nature which we are afforded by the special sciences must then in turn indicate nature's fundamental forces as being essentially causal, and furthermore physically acceptable, in their structure. To wit, Bird's accession to a picture of the world wherein its fundamental structure is identical to the principles and forces which accord with those exhausted by ultimately physical states of affairs would require then that the full run of properties at all levels, and the nomological forces appertaining thereto, be ultimately decomposable into causally-grounded properties and forces. As such, in the case of macroscopic properties, or properties which obtain in virtue of the higher-order functions of a given system, the properties appertaining to the higher-order functions, as opposed to those of the more rudimentary constituent components of the system, as in for instance the behavioral inventory of a given species, must therefore be capable of being mapped-onto the same property base which accounts for the strictly physical properties of the individual

particles. For instance, in the case of the previously cited eusocial fitness characteristics of ant colonies, the complex problem solving capacities and the communicative facility which underlies it must be derivable from the physically acceptable physiological, communicative, and otherwise behavioral capacities with which individual ants are endowed. More specifically, in order that Bird's thesis as to the fundamentally physical foundation of reality's structure be upheld when considering such examples as the above, the same physically acceptable essential underlying mechanisms and dependence relations which underpin the rudimentary mechanistic properties of the particles' functional inventory must be demonstrated as being capable of accounting equally well for the more complex macroscopic properties and dependence relations corresponding to the ant colonies' eusocial fitness characteristics.

While advancing a view which certainly provides a consummate counterargument to both critiques of the viability of dispositions in accounting for the ground of properties and the role and necessity of the laws of nature appertaining thereto, the picture of dispositional essentialism defended by Bird does nonetheless present with a number of loose ends which, if a disposition monist conception of fundamental properties is to be maintained, must be addressed and remedied in kind. Specifically, Bird's view encounters a number of pitfalls when engaging with certain facts of nature relevant to the viability of a picture of relations wherein the profile of potencies are exhausted but their causal roles. To this end, growing appreciation of the limitations of strictly causal relations in accounting for nature's essential mechanisms thus constitutes perhaps the key inadequacy of Bird's picture of the ground of fundamental properties. Most particularly, cases concerning the relationship of the properties attendant to the constituent particles of a system to those properties which obtain at the macroscopic level of the system present among the most fundamental challenges to conceptions of property identity as being fixed by its strictly causal profile. To wit, instances of non-linear emergence encompassed by work the like of theoretical physicist Robert Laughlin on symmetry breaking in complex particle collectives appears to indicate the irreducibility of the macroscopic properties obtaining when entering into complex aggregations, such as in crystal formation, wherein the determining relations at play confer "preferred positions" upon the crystal's constituent particles. (Laughlin, 2005) More specifically, as demonstrated by the behavior of complex particle

aggregations, the determining relations which obtain between the constituent particles of such aggregations cannot be accounted for by elementary stimulus / reaction dynamics between the individual particles and their environment. This can be taken as the case given that the downward influence effected by the macroscopic determining relations of complex aggregations thus precludes the invocation of strictly causal relations in determining the behaviors of a complex aggregation's constituent particles insofar as these determining relations obtain in a synchronous, discontinuous fashion to the systems's constituents, with these relations thus evidencing potencies which exact a formative influence upon the system's constituent particles that in turn cannot be modeled by rudimentary stimulus / reaction dynamics. Thus, as demonstrated by such cases as this, explanatory priority must be given not to the causal profile of each property ascribable respectively to a given stimulus and its output, but rather to the broader systematic role it fulfills in the wider manifold of nature's macroscopically conditioned processes such that the identity of a given property is to be found in the macroscopically-oriented nomological foundation which underpins its presentation as such.

The Machretic Nomological Picture

In view of the inadequacies endemic to the various flavors of dispositional monism examined prior with respect to both the structure and ground of the identity of fundamental properties, and most particularly concerning the relationship of fundamental properties to physically compatible conceptions of the laws of nature, the challenge then remaining is to identify a viable alternative which meets the synoptic aims and attendant essential theoretic commitments intended by dispositional monism, but which is also in keeping with the necessities of accounting for nature's complex macroscopic processes. To this end, given the principal challenges faced by the more traditional varieties of dispositional monism arise most acutely from their failure to adequately account for the more complex, macroscopic properties and relations which present in higher-order natural phenomena, any further attempts to reconcile the essential tenets of dispositional monism with our falsifiable appreciation of nature's structure must then be attuned to the nomological consequences of incorporating non-linearly emergent macroscopic processes into such an account of fundamental properties. More specifically, as examined respectively

in the standard-bearing cases of Stephen Mumford's nomological anti-realist and Alexander Bird's fundamentally physical conceptions of dispositional essentialism, the theoretical inadequacies endemic respectively to each, deriving principally in both instances from a reliance upon a conception of fundamental properties which takes as their base the fundamentality and completeness of physics, positions each of these flavors of dispositional monism as incapable of accounting for the putatively strongly metaphysically emergent non-linear properties of macroscopic processes. To this end, in making any attempt to satisfactorily account for macroscopic processes within a dispositionally monistic framework, in order to suitably provide for the synoptic requirements entailed in considering the consequences of complex macroscopic systems, an appropriate account of the laws of nature from which the nomological footing of a dispositional essentialist conception of fundamental properties can be established must then be derived, an account which is capable of making sense of the putatively non-causal, strongly metaphysically emergent fundamental ordering relations at play therein.

When taking under consideration the non-linear, strongly metaphysically emergent nature of certain macroscopic processes in establishing the ground of dispositional monism, and concerning particularly the nascency of this line of reasoning, any alternative which might be developed or adopted in service of this aim will of course be comparatively rough-hewn and tentative in its footing. This said, possibly the most suitable candidate readily on the market at present, namely the concept of machretic determination, has been developed within various domains of the higher-level special sciences precisely with the aim of accounting for the putatively non-linear relation of strongly metaphysically emergent macroscopic properties to the strictly physical properties of their constituent particles. The concept of machretic determination most essentially posits macroscopic properties to downwardly relate to the constituent particles of their respective system by way of non-causal, non-compositional role-shaping functions through which the behavior of their constituent particles is conditioned. (Gillett, 2016) More specifically, by the lights of machretic conditioning, the macroscopic properties of a given system possess a form of functionality over and above what any composite relation of the endowed powers of the constituent particles could linearly produce, additively or otherwise, with this therefore evidencing forces exceeding those appertaining strictly to a system's composing

constituents. Most essentially, the core tenets of the machretically conditioned nomological picture posit the fundamental subsistence of non-linearly emergent macroscopic properties to obtain as a consequence of conditioned, non-compositional aggregation. By the lights of the machretic conditioning thesis, those properties which obtain at the macroscopic level of a system are held to emerge as a consequence of the introduction of novel, non-physically acceptable, nomic forces, nomic forces which are introduced when the constituent particles of a system enter into aggregate relations, relations which obtain discontinuously with respect to those obtaining at smaller-scale sub-cohorts of the same constituent particles. (Gillett, 2016) To this end, the particular form of relations which present in relevant cases of macroscopic, conditioned aggregation do so in a fashion which precludes their inclusion within frameworks which permit of continuous, linearly derived gradations of levels within a system such that the properties appertaining to the higher-level functions of a system could be accounted for as merely additive features of the aggregate interactions of a system's individual rudimentary constituent particles (Gillette, 2016) As such, the additional potencies which are imparted to the functional inventory of particle collective systems in virtue of entering into machretically conditioned relations which obtain such that these powers are ultimately begotten in virtue of non-productive, non-causal, role shaping determining relations, determining relations which are themselves wholly interdependent and mutually realized at their root. As such, in adopting a machretic picture of the laws of nature writ large, and thus not only concerning specific, limited systems within nature, the laws of nature would be held as identical with the macroscopic conditioning determining relations, determining relations from which the structure of nature and its respective constituent systems would be understood as most fundamentally deriving their functional characteristics. (Gillette, 2016)

When considered with respect to its further consequences for articulating the nomological ground of dispositional essentialist frameworks in accounting for fundamental properties, the foundations of the dispositional monist program must be revisited in terms of both their relationship to the laws of nature and the role of strictly physical properties (i.e. causation, etc.) therein. More specifically, in contrast to the substance of such debates as those which have taken place between the likes of Alexander Bird and Stephen Mumford regarding the ontological status of the laws of nature, debates which have turned primary

on such matters as the externality vs. internality and the corresponding governing role of the laws of nature exerted over properties, when expanded to encompass the nomological ground of fundamental, essentially dispositional properties, a machretic picture of the laws of nature would entail rather questions regarding how exactly to account for the structure, individuation, and subsidiary determining relations of fundamental properties relative to their subsistence within an essentially macroscopic, mutually-determinative whole. (Bird, 2007) To this end, questions regarding the externality vs. internality and governing role of the laws of nature would be circumvented entirely insofar as the laws of nature would comprise simply the systemic, structurally interdependent, mutually determinative conditioning relations both obtaining between systems of composing constituents, and the attendant properties thereof as well as being essential to the structure of the properties themselves.

The core of machretic determination's implications as stated prior correspond to the ultimately fundamentally mutualist picture of nature's structure it puts forth, a conception of natural order which contrasts sharply with the reductive impetuses animating the essential conceits of frameworks which both assume and advocate the completeness and fundamentality of physics. More specifically, as highlighted in the attendant critiques of both the broad iterations which they represent and particular commitments of Stephen Mumford and Alexander Bird's varieties of dispositional essentialism, the orthodox reliance of dispositional essentialist frameworks upon grounds admitting of the fundamentality and completeness of physics is both rendered untenable when acceding to the basic, emergentist synoptic impetus of machretic determination, and in equal measure, the primary aims and persistent theoretical tensions of dispositional essentialism might well find their resolution in adopting the essential tenets of the machretic conditioning. To this end, the incorporation of machretic conditioning into dispositional essentialist frameworks would necessarily entail developing an account of the nomological ground of fundamental properties, and most importantly the relationship of fundamental properties thereto, which takes as its base an essentially macroscopic, mutually determined subsistence of fundamental properties. More specifically, a machretically-informed dispositional essentialist framework would necessarily operate from an assumption of the mutual determination of properties, and attendantly the

subsistence of fundamental properties within the greater whole of machretically determined systems, and furthermore the machretically determined structure of nature as a whole. This being the case, the task next to be fulfilled is to develop and articulate rudimentary, preliminary assumptions which would be adopted in advancing a monistically dispositional program which is compatible with the essential tenets of machretic determination, a ground which putatively accounts for the essential structure and relational mode of manifestation of a monistically dispositional conception of properties while admitting of the inadequacy of causal frames of analysis in satisfying this end. As such, the remainder of this paper will be devoted to articulating a preliminary, tentative outline of the fundamental assumption which might provide for a machretically grounded, monistically dispositional framework, a framework which will both allow for the continuation of the dispositional monist program in light of complex macroscopic phenomena, as well as, I would submit, point toward the means by which the promise of dispositional monism might be more fully realized.

The Structure of Machretically Grounded Dispositions

Given the peculiarities of the machretic conception of the laws of nature, not least concerning the primacy it accords to macroscopic properties and relations, developing fully a systematic, dispositionally monistic account of fundamental properties requires the unpacking of the implications of adopting macroscopic nomological fundamentality in deriving the specific shape which the corresponding structure of properties might take. More specifically, in virtue of the particular caveats imparted to questions concerning the ground of dispositions when upholding a machretically nomological constitution of nature's structure, caveats which turn on the full-stop mutual interdependence of any and all properties, any account which can be given of the rudimentary structure of properties must therefore accord with the subsistence of all properties being rooted within a mutually realized, essentially wholistic structural ground. As such, when taking on board the essential tenets of the machretic picture of the laws of nature, the core stipulation of the non-causal, role-shaping essence of the laws of nature would require that the any account of properties adopt the foundational ground of properties as being at base supra-causal and furthermore essentially dependent upon the mutually-realized whole of nature's

structure. (Gillete, 2016) Taking this as being the case, and given the structural mutualism required of a machretic picture of natural properties, the identity of said properties must be held as essentially congruent with the non-compositional, non-productive, non-causal determining relations which form the central tenets of the machretic conception nomological structure. To this end, both as a matter of programmatic intent and as natural consequence of acceding to the core tenets of machretic conditioning, the traditional synoptic reliance upon cleanly reductive descriptions of the foundational interrelations of nature's structure becomes untenable. Consequently, in acknowledging the inadequacy of physicalist reductionism in satisfactorily meeting the synoptic requirements of providing for nature's fundamental structure, the adaptation in turn of our descriptions of nature's processes such that they are capable of providing for a much more complex, mutually interdependent, systems-level oriented picture of the ground of nature's fundamental properties is therefore required.

In view of the putative structure of fundamental properties as congruent with the machretic conception of the laws of nature, as a consequence of the tenets of this picture, the adapting of dispositional monism to reflect these commitments requires a fundamental rethinking of not only the manner in which the identity of property finds its ground, but also the form of relations by way of which fundamental properties relate to both nature's nomological structure as well as among themselves. This being the case, the structural interdependence which forms the central tenet of the machretic picture of the laws of nature precludes any deference towards the specific essence itself of a given manifested property as providing in any sense the exhaustive ground of said property. (Gillete, 2016) As such, any discrete property manifestation would be taken then not as the expression in re of a specific, intrinsically-grounded disposition toward a particular manifestation on the part of the singularly disposed causal efficacy possessed by a given property, but rather the mutually-realized expression of a broader systemic natural necessity, with any manifested property being taken as a necessary component in maintaining the whole, machretically constituted system's structural integrity such that the structure of the system in its entirety would be incoherent in its absence. For example, in describing such cases as the manifestation of the property of mass, the property of mass would be held as manifesting as such as a consequence of the suite of factors by virtue of which the attribute of mass is

possessed, i.e. the laws of classical mechanics, the special theory of relativity, the elementary geometric delimitations of Minkowski space, etc., by virtue of which any given object is imparted mass such that it would be dubious to consider the property of mass as it expressed within our immediate, sense-perceptible universe absent those structural elements which provide the ground of its possibility. Therefore, with this requisite structural mutualism being taken as the case, the natural necessities by virtue of which properties derive their manifestation would be held as necessary entailments which are part and parcel of nature's machretically determined, fundamentally macroscopic structure, with these natural necessities in turn being identical with the manifesting relations by virtue of which a given property is expressed in re.

In observing the previously stated theoretical commitments, specifically, in holding fundamental properties to derive their realization in virtue of relations which correspond with natural necessities which in turn are coextensive with machretic role-shaping determining relations, the manner in which fundamental properties are to be accounted for with respect to their manifestation in the world differs substantially from both other iterations of dispositional monism as well as all other conceptions of fundamental properties stemming from the commitments of the fundamentality and completeness of physics. Further to this, given that fundamental properties obtain in virtue of natural necessities in the form of machretic role-shaping determining relations, the manifestation of nature's fundamental properties must therefore find their subsistence in strictly non-productive, non-compositional, mutually interdependent determining relations characteristic of machretic conditioning, with these natural necessities being in turn responsible for the manifestation of properties. Thus, contra the standard modeling of dispositions as causally efficacious powers in the going discourse on dispositions, as a consequence of the commitments of machretic nomological structuralism, the picture of the natural necessities corresponding to the relations in virtue of which properties derive their manifestation must then be established as operating in the absence of frameworks reliant upon externally effective manifesting stimulus relations.

In contrast to conceptions of dispositional monism which hold intrinsically grounded properties to derive their manifestation by virtue of entering into external, causally efficacious relations which trigger a given manifestation in a particular set of

circumstances, a machretically grounded conception of dispositions would hold the the relations in virtue of which the manifestation of properties obtain to constitute facets of a particular machretic structural niche, with manifested properties being thus disposed toward its manifestation from the particular systemic role it fulfills, with these natural necessities being in turn entailed by the full remit of a system's machretically determined structure. As such, the dispositions of any given set of entities to produce a given effect within particular contexts would be properly described as manifestations of a single disposition in the form of the natural necessity manifest there-between. More specifically, the identity of a given property would thus be synonymous with components of natural necessities which are themselves identical with functional niches of machretic role-shaping processes, or more specifically, rather than a given property being conceived of as finding its ground in the profile of its causal efficaciousness, properties would be held as coterminous, and thus identical, with natural necessities as structurally entailed by the broader machretic nomological foundation of nature's structure.

In sum, having developed a preliminary sketch of the fundamental assumptions underlying the structure which a machretically grounded dispositionally monistic framework might take, as a latent consequence of this enterprise, the implications of such a framework in terms of synoptically structuring our understanding of natural phenomena should hopefully have been made apparent. Specifically, in taking the identity of properties to be exhausted by natural necessities corresponding to the functional substrates, or niches, of nature's machretically grounded structure, the principal notions underlying this framework both stand in stark contrast to most traditional approaches to framing nature's fundamental ordering relations as well as complement more recent developments in this arena with respect to our growing appreciation of the full complexity of nature's structure. Specifically, in taking fundamental properties as being disposed in virtue of the functional substrates, or niches, of nature's fundamentally macroscopic, machretically determined structure in total, the hitherto largely dominant narrative of properties as finding their ground and descriptive force within the mechanical processes attendant to strictly physical forces thus become untenable. To this end, in further developing a picture of the principal assumptions attendant to a machretically grounded monistically dispositional framework,

the manner in which such a framework would synoptically engage with nature's processes as they actually behave in the world of course begs exploration in its own right.

The Manifestation of Machretically Grounded Dispositions

Having taken a view as to how best the core structure of a machretically grounded picture of dispositions might be construed, in order to provide fully for a satisfactory sketch of a machretically dispositional framework, the particular shape of the manner in which means the potencies imparted by dispositions might come to be manifested in the world thus requires spelling-out in its own right. To this end, in order provide a picture of the expression of machretically determined properties in re, the commitment of a machretically compatible dispositional monism to the ground and identity of dispositions as being exhausted by the machretically determined structural substrates, or niches, of machretic systems, would require any account of the expression of properties attendant to the behavioral presentation of natural phenomena to hold these phenomena as extending in virtue of natural necessities in the form of the structural niche of a given machretic system with which the property is coextensive. As such, when describing the behavioral presentation of a system, its description as such would necessarily operate from a background which encompasses the corresponding property's mutually determined structural dependence relations, with these dependence relations being exhausted by the natural necessities which in turn obtain in virtue of the structural requirements of the system writ large. (Gillette, 2016) More specifically, the behavior of a given system must be considered then as presenting as a consequence of the emergence of the various respective structural entailments obtaining in a given set of circumstances in virtue of the mutually determinative structure of nature's nomological constitution, with the behavioral outputs thereof being taken as inextricably bound up in the structural necessities of the system as a whole. As such, in demonstrating the viability of this program, the commitments a machretically grounded, monistically dispositional framework in terms of the full-stop systemic mutual dependence of all fundamental properties must therefore be demonstrated as synoptically attuned, and therefore congruent, with the properties of natural phenomena as they present in the world.

In terms of identifying specific cases which suitably illustrate in concrete fashion the central conceits of a machretically compatible dispositionally monistic framework, and while the core impetus for the framework has arisen from the higher order sciences, taking as an example a phenomenon properly the province of the more rudimentary strictly physical sciences would thus provide a broader picture of the applicability of a machretically grounded dispositional essentialist framework. To this end, the propensity of certain elements toward radioactive decay provides an ideally illustrative case in this regard, given that, while appertaining to more rudimentary, physically acceptable phenomena, being a stochastic phenomenon, it nonetheless defies the traditional reliance of physicallist-oriented synoptic frameworks upon the causal efficaciousness of properties insofar as its manifestation is triggered in the absence of any form of directly causal relation. (Coughlan, 2006) In addition, radioactive decay is structurally situated within nature in such a way that it provides an ideal example of the kind of structurally mutual interdependencies obtaining at multiple levels of natural structure posited by machretic conditioning. To this end, in applying a machretically dispositional essentialist framework to spontaneous radioactive decay, the disposition of certain elements toward falling into radioactive decay would be held as obtaining as a manifestation toward the natural necessity corresponding with its essential function within the structure of nature's machretically determined nomogological constitution. More specifically, the disposition of a given element to enter into a state of radioactive decay would be described such that its propensity to do so constitutes a component of a necessary functional niche within the machretically determined structure of nature such that nomological structural integrity of nature on the whole is predicated in part upon the existence of radioactive decay. More specifically, by the lights of this framework, the property of being disposed to radioactive decay is essential to the manifestation of other properties which are in turn equally vital for the functioning of natural processes writ large, spanning every level natural phenomena. For example, in the absence of the disposition toward radioactive decay, and perhaps first and foremost, given radioactive decay's position as part of the broader process of particle decay, the vital natural functions permitting of the diffusion of energy would thus be impossible insofar as the very mechanism which permits for the diffusion of energy necessarily entails radioactive decay by extension of its structural constitution. (Coughlan,

2006) In turn, in the absence of the process of energy diffusion, and in addition to its role in facilitating other strictly physical processes, the functioning of virtually all higher-order natural phenomena would be impossible in its absence given the vital role of energy in the functioning of virtually all processes in nature. As such, by the lights of a machretically grounded monistically dispositional framework, the propensity toward radioactive decay would constitute a natural necessity corresponding to the machretic niche of the elementary process of energy diffusion with this niche in turn being mutually determined by the structural requirements of nature's machretic constitution writ large

In addition to the vital role of radioactive decay in strictly physical functions, it possesses also enormous significance in predicating the structure of macroscopic, as well a more generally higher-order, phenomena, with its role as such serving to further demonstrate the plausible machretic mutual interdependencies which ground nature's structure at every level of complexity. Specifically, in the instance of the rudimentary life functions of living organisms, the very mechanical basis of these functions, namely the process of metabolization, is itself a complex mode of energy transference and transformation whereby the essential energy needed to sustain organisms is transferred from food sources in the external environment into the internal life processes of a given organism. (Becker, 2001) Further in this vein, in broadening the frame to encompass macroscopic life processes, revisiting the example used prior, in the case of the eusocial fitness characteristic of ant colonies, while the rudimentary life functions of a colonies' constituent particles, i.e, the ants themselves, are dependent upon the process of energy metabolization, the systems-level eusocial fitness characteristics evidenced by the behavior of the colony as a whole are nonetheless wholly in-deducible from the rudimentary function of energy metabolization given that they exhibit properties which cannot be in any fashion linearly mapped-onto the physically grounded capacities of the constituent particles. (Wilson, 1988) This being the case, the relations appertaining to the functional dynamics between the various levels of functionality in colony-systems as a whole, within which the structural niche which radioactive decay forms a component fulfilling an upwardly compositional role, we can see the natural necessities which, by the lights of a machretically grounded dispositionalism, subsume the structure of nature, with, at both the most rudimentary as well as macroscopic level, the manifestation of a given property

appertaining to a given one system being intimately and essentially dependent upon the nomological constitution of nature's structure in its entirety.

In sum, having taken as a base the proposed machretically compatible adaptation of dispositional monism, and having thus accordingly attempted to sketch a tentative picture of the application of this framework with respect to accounting for the manifestation of properties in re, the core implications and promise of the commitments of machretic conditonioning in terms of providing a synoptic lens through which the relational dynamics of macroscopic processes and their respective rudimentary, subsidiary constituent particles has thus hopefully been further illustrated. Specifically, in examining such cases as the disposition of certain substances toward radioactive decay, the efficacy of a machretically-grounded dispositional essentialist framework in resolving the tensions manifest in attempting to account for the dynamics of complex, non-causal processes and their attendant properties with the toolkit afforded by the ontological commitments of physicalism. In this regard, when encompassed within a machretically informed dispositional essentialist framework, the challenges presented in attempting to establish the ground of the disposition of the putatively non-causal manifestation of radioactive decay are ameliorated insofar as, rather than accounting for the presentation of the phenomenon as such by way of frameworks trading in strictly cause and effect dynamics, the manifestation of radio active decay would be seen as manifesting in virtue of its necessary entailment as a facet of the broader structural niche of energy of transformation in the structure of nature on the whole. Furthermore, the relationship of the structural niche of which the property toward radioactive decay is part and parcel, when framed explicitly in terms of machreiotic condioning, constitutes a necessary predicate of higher-order phenomena such that, while the properties which these processes instantiate are emergently ontologically autonomous from those appertaining to radioactive decay, radioactive decay is nonetheless indispensable in accounting for the full range of their functionality. As such, the complex phenomena of radioactive decay would obtain in virtue of its forming a necessary component of the broader structural necessities essential to the integrity of the constitution of our actually existing world. Thus, as illustrated by such cases, the application of a machretically grounded dispositional essentialist framework both provides a plausible, falsifiable ground for dispositional monism as well as a means

through which complex, non-causal structural relations within nature might be synoptically encompassed.

Conclusion

In the course of this paper, I hope to have satisfied the task of setting the preliminary course for a synoptic groundwork capable of making sense of the range and extent of nature's structural complexity. I have sought to fulfill this aim by way of articulating the principle initial architecture of a theoretical framework which takes as its base a conception of the laws of nature and natural properties which accommodates the complexity of macroscopic systems and the relations which obtain downwardly therefrom. More specifically, in articulating the principal assumptions which would underpin such a framework, the apparent difficulty presented in accounting for nature's structure in light of the putative unsuitability of a fundamental physics in fully encompassing macroscopic processes forms the principal impetus of developing a synoptic framework which account for fundamentality without the aid of a reductive physicalist base. To wit, this objective follows on acknowledging the necessity of developing a fulsome understanding of the dynamics of the complex interrelationship of nature's composting constituents, and the properties which they instantiate, requires an at least practical recognition of the utility of developing frameworks which accede to a picture of nature's structure as functioning, at least in the case of certain macroscopic processes, at the level of the whole system, and thus counter to the standard physicalist conceit as to the completeness of physics and thus the accompanying reducibility of macroscopic properties thereto.

In view of this end, the principal focus of developing such a conception of dispositional monism has been to articulate a preliminary groundwork for frameworks capable of serving as a baseline alternative to a fundamental physics, a framework which provides a foundation for synoptic accounts of nature's structure compatible with our ever greater appreciation of the enormity and scale of nature's complexity. In short, this outlook considers fundamental properties to be the expression of natural necessities corresponding to the structurally entailed, mutually realized attributes within nature such that when we speak, for instance, of the disposition of cottonwood toward low flammability, we speak of the essential entailments of its ecological niche vis-à-vis the

particular biome of which it forms a part, with this attribute furthermore reflecting the essential chemical and physical structural dynamics upon which the whole of the biosphere is dependent. Accordingly, this conception of fundamental properties endeavors to provide a synoptically unifying account in fidelity with the various facts of the world afforded by our inquiry into its fundamental structure, a picture which points ever more definitively toward the primacy of the macroscopic, irreducible complexity in the fundamental ordering of the world. As such, the primary impetus animating the development of the machretically grounded monistically dispositional approach flows from a desire to steer metaphysics in a direction in closer fidelity with the aforementioned evidence indicating ever more convincingly an emerging picture of the world relative to which the the reductionistic conceits of physicalism are to my mind, in any case, synoptically inadequate. Furthermore, in the preliminary development of this program, I hope to have by extension demonstrated the potentially indispensable role of metaphysics in resolving problems concerning the fundamental structure of nature such that new territory might be cleared in which fruitful lines of inquiry might be pursued both in advancing the discourse within metaphysics itself as well as, by extension, ultimately positioning research in metaphysics to be potentially of profit beyond its own concerns.

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