Tropes in Space

Daniel Giberman

Barnett Newman’s painting *Jericho* is a black, triangular canvas bisected by a vertical red strip. Understood as a material object in space and time, the painting possesses what pre-theoretically may be called *features*. It is distinctly black, red, triangular, and so forth. There is a longstanding debate in metaphysics over whether a given object’s features are particular as opposed to universal, that is, whether they are *tropes*. The stakes in this debate are high. Nearly every subfield of philosophy invokes implicitly an ontology of features. Yet universals are difficult to square with naturalistic commitments about the spatiotemporal status of ordinary and scientific objects. And tropes have been criticized for bearing unclear individuation conditions and puzzling relations to objects. If these concerns cannot be discharged then perhaps universals are preferable, worries from naturalistic spatiotemporal expectations notwithstanding.

After motivating tropes, the present essay offers new accounts of two central aspects of the trope ontology: the spatiotemporal status of tropes and the relationship between tropes and material objects. The key idea behind the first new account is that tropes are numerically identical to their intrinsic spatiotemporal features. The key idea behind the second new account is that certain theoretical roles played elsewhere by bare particulars\(^1\), substantival spacetime regions\(^2\), and primitive compresence relations ought to be reassigned to a single *sui generis* property, whose instances may then be used to “bundle” tropes into objects. Per trope theory, this novel property just is a primitive resemblance class of tropes. The upshot is an ontology

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\(^1\) Bare particulars are non-characterizing individuators. See (Armstrong 1989), (Moreland and Pickavance 2003), and (Sider 2006). For an argument against bare particulars, see my (2012a).
\(^2\) Substantivalism is the thesis that spacetime is itself a substance.
committed only to spatiotemporally located tropes. This should be a welcome result for any Ockhamist—metaphysician or not—who works presupposes a property ontology.

Of course not everyone is open to tropes. Perhaps you hold antecedently that features are universals; or that there are no features, just objects; or that there are not even any objects, just relational structures. Fair enough. The present sermon is aimed largely at the choir, leaving the bulk of the missionary work for another day. That said, there are two reasons why what follows should interest even readers presently turned off by trope theory. First, novel responses will be given to the common worries about trope individuation and bundling. Second, friends of universals might well be attracted to the general idea that bundling is determined by a first order property instead of a primitive external relation. Aspects of the bundle theory developed here are exportable for that purpose.

The essay is structured as follows. Section 1 clarifies and motivates trope theory. Section 2 presents the advertised account of the spatiotemporal status of tropes. Section 3 assesses the logical space of answers to the bundling objection. Section 4 uses the account advanced in section 2 to develop a novel bundle theory. Section 5 uses the new theory to defend trope theory’s treatment of properties as trope resemblance classes. Finally, section 6 offers a cost-benefit analysis of the new framework.

1. Tropes

Virtually all trope theories entail the three following claims.

(i) Tropes are particular, non-repeatable features. For example, Jericho’s redness trope (or, for those who accept only fundamental properties and objects, an
electron’s charge trope) is qualitatively identical to, but numerically distinct from, the redness trope of a *Jericho* print (charge trope of a distinct electron).

(ii) Properties such as redness and charge are resemblance classes of tropes, where resemblance is understood as a primitive internal relation.  

(iii) *Trope* is an ontologically fundamental category.

The version of trope theory that will be defended below entails three further claims:

(iv) For arbitrary concrete object $a$ and arbitrary time $t$ at which $a$ exists: $a$ is either identical to some bundle of tropes at $t$ or such that its existence at $t$ is derivative upon some bundle of tropes at $t$, where an item is concrete just in case it is located in space and time.

(v) Arbitrary concrete object $a$ exemplifies arbitrary property F just in case some trope T is a member of both the F class and the $a$ bundle.

(vi) Tropes are concrete.

The Ockhamist ontological attitude that less is more (*ceteris paribus*) motivates each of (ii) – (vi). The Ockhamism in (ii) is illustrated by the internality of resemblance. Since the resemblance among some tropes is fixed by their existence, it is not an additional ontological investment. The Ockhamist leanings in (iii) are straightforward as well: the more the trope theorist can excise from the big book of traditional metaphysics by telling a story committed only to tropes, the better. Claim (iv) is motivated indirectly by the ontological baggage of its chief competitor, bare particular theory. Given (ii) and (iv), claim (v) is motivated by theoretical

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3 An internal relation is one whose exemplification is secured by the intrinsic nature of its relata. For an exception to (ii), see (Ehring 2011).

4 N.B., this sense of ‘concrete’ is consistent with Keith Campbell’s (1981, 1990) use of ‘abstract’. Campbell’s abstraction is the mental act of considering an item in isolation from others.

5 I sometimes will use ‘exemplifies’ as shorthand for bundle membership.
economy. Finally, (vi) is motivated by the parsimony of ontological “naturalism” in David Armstrong’s sense—the thesis that *everything* is concrete—as well as by core motivations for general trope theory from causation and perception (Schaffer 2001).  

While claims (i)-(vi) help to clarify trope theory, they also leave a number of important questions open. Claim (iii) leaves open whether any non-tropes are ontologically fundamental and claim (iv) leaves open the criteria for determining bundling. Call these ‘the ontological question’ and ‘the bundling question’. Given trope theory’s Ockhamism, it would be best to answer the former conservatively. Accordingly, it would be best to answer the latter by invoking as few non-tropes as can be managed. These goals guide the accounts developed below. In addition to the open questions, there are two worries for trope theory that will be of present interest. Claim (ii) (that properties are trope resemblance classes) faces David Manley’s (2002) versions of the co-extension and imperfect community objections, to be discussed in section 5. Claim (vi) (that tropes are concrete) faces the charge of confusing tropes with material objects. This worry will be addressed presently.

2. Tropes in Space

Let us say that an item *x* is ‘independently spatiotemporal’ just in case there is no disjoint item *y* such that *x*’s being spatiotemporally located requires the existence of *y*. Material objects like *Jericho* are independently spatiotemporal. Even for the substantivalist, who requires a spacetime region for *Jericho* to occupy, there is no *particular* region *R* such that *R* must exist in order for *Jericho* to be spatiotemporal. Nor is there some one spacetime in which *Jericho* must exist; other possible spacetimes contain it (or its counterparts). For an example of a *dependently* spatiotemporal item, consider a transcendent universal instance *Fa*. *Fa* is spatiotemporally

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located only if either (1) the universal in question, F, is exemplified by a spatiotemporally located object or point, a, which would be a bare particular, or (2) F is co-exemplified with a locational universal or occupation relation, which requires a to occupy some region R. Notice, then, that spatiotemporally located transcendent universal instances carry the burden of commitment either to bare particulars or substantivalism.

Some theorists may take tropes to be akin to universal instances and endorse claim (vi) only if it is interpreted as stating that tropes are dependently located in space and time. But we have just seen that the ontological cost of this interpretation of (vi) runs counter to trope theory’s Ockhamism. Consequently, the trope theory to be defended here takes tropes to be independently spatiotemporal. Each trope exemplifies a particular, non-repeatable, intrinsic spatial volume, spatial shape, and temporal duration.7

Sizes, shapes, and durations are features. Particular, non-repeatable features are tropes. It follows that particular, non-repeatable sizes, shapes, and durations of arbitrary tropes are themselves tropes. It then follows from thesis (v) (the analysis of exemplification in terms of trope bundling) that in order for some trope T to have a size, shape, and duration, T must be a bundle that has size, shape, and duration tropes as members. Prima facie, this attempt to stretch first order trope bundle theory into a second order theory gives rise to a puzzle: how can an arbitrary trope be a bundle that contains other tropes? One way to discharge the puzzle is to require thesis (v) to be read as an exclusively first order claim. However, this move leaves no account of the second order properties whose exemplification the independent spatiotemporal reading of thesis (vi) requires.

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7 Hereafter I will speak simply of ‘size’, ‘shape’, and ‘duration’. Sizes and durations may be arbitrarily small and shapes may be arbitrarily simple.
As a first step toward explaining away the puzzle without giving up a unified account of the requisite instances of second order exemplification, I hold that every trope is bundled with itself. Every trope $T$ is a bundle, one of the members of which is $T$ itself. Thus, given (v), every trope exemplifies itself.\footnote{Recall that thesis (iv) leaves open whether concrete objects are numerically identical to bundles or merely derivative upon them. When the concrete objects in question are (sparse) tropes, however, they cannot be derivative on anything, given thesis (iii). Accordingly, I will assume the numerical identification reading of (iv) in the second order cases discussed in the text.} *Jericho*'s redness trope, for example, is itself red. Let us call this ‘reflexive exemplification’.\footnote{It is worth preempting the worry that reflexive exemplification is threatened by Russelian paradox. The key is to disallow that the predicates that give rise to paradox (e.g. ‘not being self-exemplifying’) express genuine properties. There is also a prima facie worry from sortal properties like *being an oak tree*, for intuitively no tropes are oak trees. Again the best response is to reject such properties.} The second step in explaining away the puzzle invokes the following notion:

(Inter-Exemplification): the members of an arbitrary class of tropes *inter-exemplify* one another just in case each exemplifies every other.

The second step involves two claims. First, inter-exemplification only obtains for single tropes; if a class of tropes satisfies (Inter-Exemplification) then it has exactly one member.\footnote{If this is correct then inter-exemplification and reflexive exemplification are extensionally equivalent.} Second, the cases of second order exemplification that give rise to the puzzle—size, shape, and duration—are in fact cases of inter-exemplification. If this much is correct then a given trope’s size, shape, and duration tropes reduce to one.

To see that inter-exemplification only obtains for single tropes, consider without loss of generality $M_1$, the mass trope of my computer at time $t$. $M_1$ has a mass trope, namely itself, a duration trope, $D_{M_1}$, a size trope, $V_{M_1}$, and a shape trope, $S_{M_1}$. If we stipulate the inter-exemplification of $M_1$, $D_{M_1}$, $V_{M_1}$, and $S_{M_1}$, it follows from (v) that $M_1$ just is a bundle that includes itself, $D_{M_1}$, $V_{M_1}$, and $S_{M_1}$ as elements. Given the inter-exemplification stipulation, this
same form of argument applies for \( D_{M_1}, V_{M_1}, \) and \( S_{M_1}, \) respectively. Since there are no other intrinsic features of \( M_1, D_{M_1}, V_{M_1}, \) or \( S_{M_1}, \) it follows that each of these tropes is numerically identical to the same bundle, that is, \( M_1=D_{M_1}=V_{M_1}=S_{M_1}= \) the bundle: \( M_1 D_{M_1} V_{M_1} S_{M_1}. \)

Requiring that tropes be independently spatiotemporal does not lead to a bundle-confounding explosion of size, shape, and duration tropes. Rather, the particular size, shape, and duration features of arbitrary trope \( T \) are nothing over and above \( T \) itself. The present account of tropes thus has an element in common with nominalism: while a given trope \( T \) has multiple size/shape/duration ‘respects’, there is only the one trope, \( T. \) As we will see below, however, the view differs from nominalism in denying that something might be in, say, both the \textit{taupe} resemblance class and the \textit{mass} resemblance class. \( T \) is a member of multiple property classes if and only if size, shape, and duration count as genuine properties.

What remains to be shown is that inter-exemplification obtains outside mere stipulation. Notice that whichever size (or shape) trope \( D_{M_1} \) exemplifies will exactly resemble \( V_{M_1} \) (or \( S_{M_1} \)) with respect to size (shape). Parsimony thus motivates the identifications of \( D_{M_1} \)’s size trope with \( V_{M_1} \) and its shape trope with \( S_{M_1} \), given the absence of principled reasons to the contrary. That we can “abstract” apart the size, shape, and duration of a given trope in our ideology does not entail that these features are numerically distinct items. It is less clear that \( D_{M_1} = V_{M_1} = S_{M_1} \) is massive. The key is to notice that there would be no account of the exemplification of \( D_{M_1} \) by \( M_1 \) without their being inter-exemplified. After all, my computer has other tropes besides \( M_1, \)

\[ \text{11} \] It is assumed that bundles cannot be individuated intensionally.

\[ \text{12} \] One might worry that \( M_1 \) cannot be identical to \( S_{M_1} \) since \( M_1 \) is intrinsic and yet, following (Skow 2007), there is reason to doubt that shapes are intrinsic. However, if Skow’s line works against shape then it also works against mass, which may be understood as a quantity whose bearer’s parts are related to numbers.

\[ \text{13} \] Notice that to numerically identify mass tropes with their shape tropes is not to numerically identify the two properties, \textit{mass} and \textit{shape}, for not all shaped tropes are massive. Only the former identification is endorsed here.

\[ \text{14} \] This is similar to the position taken in (Campbell 1981), criticized in (Moreland 1989), and consequently abandoned in (Campbell 1990). The crucial difference is that, unlike Campbell’s 1981 view, the present suggestion identifies characterizing tropes not with \textit{locations}, but with \textit{tropes}. The objections in (Moreland 1989) thus do not apply.
each of which might well persist for just the career of $M_1$ and thus exemplify a duration trope that exactly resembles $D_{M_1}$ with respect to duration. Why should $D_{M_1}$ and not one of these other duration tropes be exemplified by $M_1$? The inter-exemplification hypothesis provides the most direct and parsimonious answer.

The present claim is not that intuitively distinct tropes may be numerically identified willy-nilly, resulting in full-scale property nominalism that eschews tropes in favor of ontologically null ‘respects’ in which objects resemble or differ. To better articulate what is being claimed, let us say that a trope is ‘merely spatiotemporal’ just in case it is a size, shape, or duration trope that does not exemplify any intrinsic character beyond size, shape, or duration. For example, $M_1$ is not merely spatiotemporal, for it exemplifies an intrinsic character—being massive—that is qualitatively additional (though not ontologically additional) to its status as sized, shaped, and persistent. The present account is neutral as to whether there are any merely spatiotemporal tropes. Let us say further that merely spatiotemporal properties are ‘non-characterizing’ and that all other familiar, character-conferring intrinsic properties such as mass and color are ‘characterizing’. Far from advocating widespread trope identifications, the present view is that inter-exemplification does not generalize beyond a given trope’s size, shape, and duration. Specifically, it does not allow the identification of tropes of two characterizing properties such as mass and color.

Notice that, given the independently spatiotemporal reading of thesis (vi), any characterizing trope $F$ must have the following four features: it must be $F$, sized, shaped, and persistent. By contrast, there is no characterizing trope $F$ that must have some distinct characterizing feature $G$. There could be colorless mass tropes, massless color tropes, etc. While this asymmetry between mass, size, shape, and duration on the one hand, and mass and color on
the other, does not *prove* that inter-exemplification cannot obtain between mass and color tropes, it does indicate it. For what could explain why one red, massive material object has inter-exemplified redness and mass tropes while another red, massive material object (say, one that will soon lose its color while retaining its mass) has merely co-bundled redness and mass tropes? It is better to hold that tropes from any two characterizing properties are numerically distinct.

Tropes also stand in mereological relations. Given that tropes are concrete, the most straightforward way to understand mereology for tropes is by (loose) analogy with mereology for regions. Suppose that trope T is exactly located at some region R, which has proper subregions \( r_1 \) and \( r_2 \). T then has a proper part exactly at \( r_1 \) and a distinct proper part exactly at \( r_2 \). If T is a trope of some non-quantitative property, say redness, then typically some of its proper parts will be tropes of that property as well. If the property is quantitative, however, for example *being 10g mass*, then the proper parts of T will be tropes of lesser quantities that sum to T’s quantity arithmetically just as their fusion sums to T mereologically. The mereology for tropes of macro sortal properties, for example *being a painting*, may be treated numerous ways. One option is that macro sortal tropes are scattered extended simples, though this seems unnecessarily exotic. A more conservative view is that macro sortal tropes are derivative upon arrangements of more fundamental tropes and, as such, are not elements of the strict trope ontology. On this view, there are paintings but not *being a painting* tropes.

One way in which the proposed analogy between tropes and regions is loose involves language. All else equal, it is desirable to avoid commitment to spacetime substantivalism since relationalism is less expensive ontologically. But substantivalism cannot be avoided if the explication of trope mereology requires unqualified quantification over regions, at least on standard accounts of ontological commitment. This problem is tractable, however, since trope
theory may import whichever relationalist mereology best does away with talk of regions—say, that mereological relations correspond to the quantitative structure of fundamental distance relations.

Another way in which the analogy is loose stems from the present attempt to remain neutral on the possibility of extended simples. If there are extended simple tropes at a given world, then mereological relations for regions may not be isomorphic to mereological relations for tropes. The basic idea remains, however, that all parts of tropes are spatiotemporal parts.15

Since tropes may be either characterizing or non-characterizing and either scattered or connected, four species suggest themselves: Scattered Characterizing (SC) tropes, Scattered Non-Characterizing (SN) tropes; Connected Characterizing (CC) tropes; and Connected Non-Characterizing (CN) tropes.16 Examples: ordinary, macro instances of color such as Jericho’s redness trope are SC, for redness is characterizing and yet there are non-red regions of space between the painting’s smallest red proper parts. Merely spatiotemporal size tropes can be examples of either SN or CN tropes since merely spatiotemporal size is a non-characterizing property that has both scattered and connected tropes. Mass is an example of a property with both CC and SC tropes.

Before discussing how the present account of the spatiotemporality of tropes furnishes a novel account of how to bundle them, it will be helpful to make explicit some additional ways in which the account is new, especially for those who antecedently are not sympathetic to, or familiar with, trope theory. Notice first that tropes do not have to be bundled with distinct tropes in order to exist. Tropes are not metaphysically posterior to material objects. For example, the

15 One useful consequence of the spatiotemporal mereology for tropes is that it blocks potential co-extension or imperfect community worries that might be raised for the above decision to identify characterizing and spatiotemporal tropes while keeping the relevant properties distinct. Such worries will be difficult to get off the ground if tropes have arbitrary undetached proper parts of various sizes, shapes, and durations.

16 The working explication of these topological notions is that of (Cartwright 1975).
qualitative tropes of my computer do not have their character in virtue of being tropes of the computer. Rather, the computer has its character in virtue of the existence of those tropes. What, then, is the difference between tropes and material objects? Answer: only the latter may exemplify more than one characterizing property. Notice further that, on the present view, tropes are not metaphysically posterior to spacetime or to distance relations. (Whether tropes are metaphysically prior to distance relations is a different matter, on which the present account is neutral.) Spacetime does not confer sizes and shapes upon tropes. Though radical in some ways, this view is consistent with versions of both substantivalism and relationalism. With the spatiotemporal status of tropes made more precise, let us look closer at how to bundle them.

3. The Bundling Question

The bundling question asks what criteria determine whether a given collection of tropes form a bundle and thus, given thesis (v), are co-exemplified by some concrete object. There are four general answers available.

(Unrestricted Bundling): For any collection of tropes C, there is some bundle consisting of all and only the members of C.

(No Bundling): There is no collection of tropes C such that all and only the members of C form a bundle.

(Primitive Restricted Bundling): It is a primitive fact that there are some privileged collections $C_1, \ldots, C_n$ of tropes such that, for each of these collections $C_i$, all and only the members of $C_i$ form a bundle.

(Derived Restricted Bundling): Some collection of tropes C forms a bundle just in case some to-be-specified relation R obtains among all and only the members of C.

There are some modifications to the standard versions of these theories that the present view of tropes suggests. Substantival regions would be identified with bundles of merely spatiotemporal tropes; and fundamental distance relations would obtain not among material objects but among tropes.

Assume that the No Bundler is a trope theorist who rejects bare particulars.
Each of the first three approaches is best resisted. Unrestricted Bundling entails widespread occurrence of two phenomena that are not plausibly widespread: vastly distant co-exemplified tropes and objects that overlap in location without overlap of parts. No Bundling faces the same problems. If the No Bundler neglects to give a paraphrase scheme for the pre-theoretic datum that *Jericho* is black and red but not purple, then his view is a non-starter. Yet the best paraphrase scheme available to the No Bundler is to replace expressions that putatively refer to bundles/objects with expressions that refer to (non-bundled) collections of tropes, in which case the same problems raised for Unrestricted Bundling apply.

Finally, the problem with Primitive Restricted Bundling is that it is difficult to discern from property nominalism since it takes facts about *pluralities* of distinct characterizing features as fundamental. Granted, it calls these features ‘tropes’ rather than invoking the property nominalist’s ‘respects’, but it is a trope theory in name only.

The preceding worries for the first three bundling approaches motivate Derived Restricted Bundling, of which there are two principal versions on offer. The first holds that bundling is determined by a primitive relation called ‘compresence’ (Campbell 1990). The other holds that bundling is determined by co-location (Schaffer 2001).

Primitive compresence probably is the most familiar theory of trope bundling. While trope bundle theorists are keen to challenge the ontological status of external relations like *brother-in-law* or *more-fashionable-than*, many are surprisingly content to bite the bullet in the

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19 Other Derived Restricted Bundling approaches include the ‘nuclear’ approach of (Simons 1994), the ‘saturation’ approach of (Denkel 1997), and the mereological approach of (Paul 2002, MS), though Paul is not a trope proponent. Simons’s approach, though ingenious in several respects, is unattractive insofar as it is committed to determinable tropes and necessary connections among distinct characterizing properties. Denkel’s theory is also committed to determinable tropes in an ontologically robust way, and is modally restricted. Finally, Paul’s (2002) approach is difficult to square with the *independently spatiotemporal* reading of thesis (vi), and her (MS) approach presupposes relationalism.
case of compresence (Simons (1994) and Denkel (1997) are noteworthy exceptions here). This is
unfortunate. Trope theory’s Ockhamist stance toward the ontological question is best served by
allowing as few non-trope fundamental kinds as possible. But primitive compresence is a
fundamental non-trope.\textsuperscript{20} As such, the argument against it is straightforward: if there is a viable
bundling mechanism that does not introduce a fundamental non-trope then it is thereby superior
to primitive compresence.

A further worry for primitive compresence is that it is not clear how it could be
spatiotemporal, and thus not clear how to square it with the general ontological motivation for
the concreteness of tropes. Perhaps the most promising suggestion is that a given bundle’s
compresence instance is exactly located at the region composed of all the regions at which the
tropes it bundles are exactly located, and that the overarching relation \textit{compresence} is just the
fusion of all such instances. But this suggestion proves unattractive in certain cases. For
example, consider two worlds, \( w_1 \) and \( w_2 \), each of which lasts for only an instant, occupies only a
single spatial point, and features only three properties, \( F, G, \) and \( H \). \( w_1 \) contains exactly three
characterizing tropes, \( F_1, G_1, \) and \( H_1 \); \( w_2 \) also contains exactly three characterizing tropes, \( F_2, G_2, \)
and \( H_2 \). \( w_1 \) and \( w_2 \) thus have identical spatiotemporal distributions of characterizing properties.
Yet on the assumption that compresence is primitive, it is allowable that while \( F_1, G_1, \) and \( H_1 \) are
compresent at \( w_1 \), only \( F_2 \) and \( G_2 \), but not \( H_2 \), are compresent at \( w_2 \). Let us call the corresponding
compresence instances at \( w_1 \) and \( w_2 \) ‘\( R_1 \)’ and ‘\( R_2 \)’, respectively. On the suggestion at hand, \( R_1 \)
and \( R_2 \) are spatiotemporally located entities that resemble one another exactly with respect to
size, shape, duration, and “intrinsic character” (since each is a compresence instance), and their
respective world-mates are qualitatively identical. Yet the exemplification facts at \( w_1 \) and \( w_2 \)

\textsuperscript{20} Ehring (2011) claims that compresence is a class of tropes, but he is unclear about whether compresence tropes
are concrete. If they are not then Ehring’s view runs afool of thesis (vi) and Armstrongian naturalism. If they are
then Ehring’s view faces the objection to concrete compresence about to be raised in the text.
differ. The problem for the suggestion that compresence is located in spacetime is how to account for this difference. The problem does not arise if compresence is extra-spatiotemporal, for it is a familiar feature of extra-spatiotemporal items that they may account for a difference between two spatiotemporally identical worlds. For example, spatiotemporally identical worlds that differ as to whether their inhabitants have souls are importantly different worlds. But if compresence at $w_1$ and $w_2$, respectively, is nothing over and above what is located where $R_1$ and $R_2$ are located, then it is difficult to see how it could be that $w_1$ and $w_2$ differ in exemplification facts. Notice that the suggestion that there is a qualitative difference between $R_1$ and $R_2$ will not help since it entails that instead of one primitive external bundling relation there are many, contra trope theory’s Ockhamism.

It seems, then, that a compresence-free ontology is to be preferred if it can be made viable. Unfortunately, the co-location theory of bundling fails this task. The problem is that it is neither necessary nor sufficient for bundling. Not necessary: there are possible fundamental objects that are, say, $F$ on one half and $G$ on the other, for distinct characterizing properties $F$ and $G$. The relevant $F$ and $G$ tropes are bundled but not co-located. Insufficient: it is plausible that numerically distinct co-located material objects are metaphysically possible; yet co-located objects will have at least some co-located tropes that are not co-bundled, lest the objects fail to be distinct. The co-location theory also bears the ontological expense of commitment to substantivalism since it requires quantification over regions in order to explicate co-location. It has been suggested (Schaffer 2001) that co-location may be understood in relationalist terms as equivalent to being at zero distance, but this is incorrect since objects may be at zero distance from one another without being fully co-located, for example if they merely are touching or partially overlapping in location.
4. A New Bundle Theory

The problems with compresence and co-location motivate a new account of bundling. The one to be proposed here takes a cue from the best way for the co-location theorist to respond to the worry that his view presupposes substantivalism. The response is that quantification over regions can be paraphrased away by explicating co-location in terms of mereology and topology. Instead of co-location requiring that some objects exactly occupy the same region, it requires merely that every part of each be in contact with some part of the other. This response does not work, however. For example, it incorrectly co-locates open objects and their closures.

Though insufficient for co-location, the suggestion would work for a relation that obtained among a collection of tropes, one of which is at least boundary-size larger than the rest. This largest trope, instead of being co-located with the others, would spatiotemporally contain them. This suggests a kind of “background” property, each trope of which functions to mark a certain location as relevant to the bundling of some other tropes. On this suggestion, a collection of tropes forms a bundle just in case all and only its members are contained within the region at which one of these “background” tropes is exactly located. Bundling would be not co-location, but co-containment. Containment could then be explicated without quantification over regions as follows. Arbitrary characterizing trope \( T_F \) is contained by a trope \( T \) of the “background” property just in case every part of \( T_F \) is in contact with some part of \( T \) excluding its boundary, where ‘boundary’ is understood pre-theoretically. This secures the ontological advantage of the co-
location view—namely, bundling without commitment to any primitive external relations beyond spatiotemporal relations—without its disadvantages.

Notice that the proposed “background” property need not be a characterizing property. Nor—for the purposes of the present dialectic—does it need to be any more detectable empirically than bare particulars, substantival regions, or compresence relations. It simply needs to have spatiotemporally located tropes. However, its tropes cannot be merely spatiotemporal in the technical sense described in section 2, for they must be capable of distinguishing themselves from surrounding locations that contain no such tropes. Since it marks some locations from others, the special “background” bundling property might aptly be called ‘markedness’. This terminology will be adopted in the sequel. Here is a first pass at the principal thesis of co-containment bundling.

**Bundle (FIRST PASS)** a collection C of characterizing tropes forms a bundle just in case there is a markedness trope T_M whose location contains all and only the members of C.

There are many ways to develop this first pass. The most promising will take under advisement the following eight theses.

1. Markedness is a novel, metaphysically basic, first order property—not a property of other properties. The world primitively divides into locations that contain markedness tropes and locations that do not. In this sense, the global markedness distribution works as a sort of binary code for fundamental ontology. Granted, there is a sense in which tropes of familiar characterizing properties like redness “mark” their locations from their non-red surroundings, but this is insufficient for bundling. Most objects do not spatially overlap redness tropes.

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21 Some philosophers maintain that metaphysically basic properties must be posited by our best physical theories. However, even these philosophers would agree that if, say, bare particular theory has the correct ontology of properties then our best physical theories, if true, must tacitly be committed to bare particulars, even though physics does not posit bare particulars. The same reasoning applies to markedness.
2. Markedness is not a property of material objects or spacetime regions. Rather, it is a property whose exemplification requires only the existence of its own tropes, which are reflexively exemplified. Material objects exemplify the properties of the tropes in their bundles, but markedness itself is not a member of any such bundle. Nor does markedness require that there are regions, talk of which may be paraphrased in the way prescribed above.

3. Markedness is not an antecedently familiar property/relation under a new name. For example, it is not bare particularity, substantiality, haecceity, quiddity, essence, compresence, or occupation. None of these properties can play the total theoretical role attributed to markedness, nor does markedness play all the roles traditionally attributed to any of these properties. Of the antecedently familiar notions listed, bare particularity and compresence are the two whose differences from markedness are the most difficult to see. But the differences are there. Unlike bare particulars, markedness tropes are intrinsically sized and shaped, not merely contingently related to sizes and shapes by instantiation. That markedness is a class of sized and shaped tropes also constitutes one of the key differences with compresence, for compresence is not a class of tropes. Furthermore, markedness, unlike compresence, is ontologically fundamental. Markedness tropes possibly exist independently of anything else. Independent existence makes no sense for compresence instances.

4. Markedness tropes serve as bundlers only if they are maximally connected, where a trope is maximally connected just in case it is not scattered and not in contact with any disjoint trope of the same property. Maximal connectedness provides an individuating criterion for bundles: bundles are formed by co-containment with respect to some maximally connected markedness trope.
5. Only connected characterizing (CC) tropes are bundled by markedness. For example, 
*Jericho*’s redness and blackness tropes are not bundled directly via markedness, but the tropes of 
each of its quarks are (assuming quarks are not scattered objects). SC tropes like *Jericho*’s 
redness tropes are bundled in virtue of the supervenience of such properties on the more basic 
properties borne by *Jericho*’s fundamental proper parts. The resulting view of property 
exemplification for material objects is thus pluralist about bundling: both co-containment and co-
supervenience are relevant for bundling, depending on whether the tropes to be bundled are CC. 
Notice, however, that both co-containment and co-supervenience fall under the Derived 
Restricted Bundling approach.

Which subvening bases are relevant for SC bundling in a given case will be a matter of 
which objects are relevant. For *Jericho*, the base consists of the properties exemplified by its 
fundamental proper parts, which properties are conferred upon those parts by CC tropes. For 
some other scattered macro object, for example the Chrysler Building, the relevant base will be 
the properties of *its* fundamental proper parts. Notice that there is no burden on trope theory to 
give necessary or jointly sufficient conditions for determining the fundamental proper parts of 
*Jericho*, the Chrysler Building, or any other material object.

This pluralist account of bundling is idiosyncratic in a way that requires some expository 
digression. The account allows, for example, that both the charge of one of *Jericho*’s electrons 
and the comparatively gigantic redness trope that we see when standing in front of the painting 
are members of the *Jericho* bundle. The former is in the *Jericho* bundle because it is contained 
by a markedness trope that bundles one of *Jericho*’s fundamental proper parts; the latter is in the 
bundle because it supervenes on the properties of *Jericho*’s fundamental proper parts. But this is 
an unusual and prima facie problematic account of bundling, given thesis (v) (the thesis that links
bundling and exemplification). The problem is that the account entails, given (v), that *Jericho* exemplifies the charge of the relevant electron!

Fortunately, this problem is superficial. The strict ontology of exemplification often deviates from our pre-theoretical intuitions about predicative discourse. Consider the following example. The fleet has two fire engines, one painted standard red and one painted in equal parts red and green stripes. Pre-theoretically, we assent to the following claims.

(1) One of the fleet’s fire engines is part red and part green.

(2) One of the fleet’s fire engines is entirely red.

However, when we scrutinize these claims from the viewpoint of the strict ontology of exemplification, we realize that (2) is problematic, for there are parts of the red fire engine—its silver bumpers, black tires, and yellow hose, say—which are not red. The example shows that our pre-theoretic intuitions about the truth values of predicative claims are not a good guide to the metaphysics of property exemplification. Just as the fire engine described in (2) is in fact silver and black and yellow, so *Jericho* is in fact of unit negative charge. This is not to say that *Jericho’s entire* charge is that of the electron (just as it is not to say that the fire engine is *entirely* silver or black or yellow); but then that is not what the pluralist account of bundling under discussion entails.

Having flagged and addressed the prima facie predication problem that arose from restricting co-containment bundling to CC tropes, it will be worthwhile to pause once more before discussing theses 6-8, which require some expository stage-setting.

Where in the metaphysics of properties are we and how did we get here? Section 2 gave us a way of understanding tropes as being rather like material objects and regions in having sizes, shapes, and durations. But tropes differ from objects in having at most one characterizing
feature, and they differ from regions in having at least one.\textsuperscript{22} We have since been told that markedness tropes are rather like bare particulars and primitive compresence in that they help to determine whether a given collection of familiar characterizing properties in an arbitrary \textit{metaphysically possible world} are co-exemplified. Like the advocate of bare particulars or compresence, the markedness theorist does not look to physics for an account of how material objects, \textit{in the most metaphysically general sense}, exemplify properties. This is as it should be. We should not expect actual physics to play any such metaphysically general role. If one takes seriously the project of accounting for \textit{metaphysically general} property exemplification for material objects then one requires a uniquely philosophical piece of machinery (a bare particular or a compresence relation or an essential connection or a maximally connected markedness trope or…). One can then assess how well the machinery in question comports with the latest physical theories and decide the extent to which its so comporting matters for modally general fundamental ontology. Perhaps it will matter greatly given the impressive predictive power of our best physical theories. Perhaps it will matter little given that physical theories remain notoriously inchoate and even mutually incompatible. This is not the place to decide this important meta-metaphysical question. I mentioned at the outset that there would be preaching to the choir. One condition for membership in this choir is a serious interest in ontological questions that outstrip the contingent dictation of actual physics. Notice that this condition accords with the uncontroversial claim that the correct metaphysically general ontology must be consistent with any actually true (contingent) physical theories.

So concludes the stage-setting. In theses 6-8, an attempt is made to combine the results of section 2 with the ideas behind theses 1-5. The proposal will be that spatiotemporal features of \textsuperscript{22}‘Supersubstantivalists’ hold that regions exemplify characterizing properties directly, merging material objects and regions in their ontology. So tropes differ from supersubstantival regions in just the same way that they differ from material objects, namely, by exemplifying at most one characterizing property.
maximally connected markedness tropes—in particular their respective shapes—determine which characterizing tropes they contain and how those tropes are arranged.

6. The shape of a maximally connected markedness trope determines which characterizing tropes it contains. The relevant kind of determination is local supervenience, understood in terms of spatiotemporal distribution, of characterizing properties on markedness. Since markedness is metaphysically basic, the supervenience will be asymmetric: markedness distribution fixes the distribution of characterizing properties, but not vice versa. Two points help to clarify this sixth thesis. The first is that, necessarily, every CC trope is contained by the location of some maximally connected markedness trope. The second is that, for arbitrary CC property F, the shape of each markedness trope that contains an F trope will fall within some inexact but highly discriminate resemblance range of shapes. That is, not all F-fixing markedness tropes need be exactly the same in shape, but they do need to be highly similar. (The hand renderings in Figures 1 and 2 below exemplify this notion of inexact similarity. Compare, for instance, the respective “F tabs.”) This highly discriminate but inexact similarity secures that the supervenience of characterizing properties on markedness is asymmetric. While two markedness tropes may differ slightly in shape while each containing qualitatively identical F tropes, no pair of markedness tropes of exactly the same shape may differ with respect to the F tropes they contain.

7. Markedness tropes are typically of greater spatiotemporal volume than the characterizing tropes that they contain. However, the difference in size between a given markedness trope and the characterizing tropes it contains may be arbitrarily small. The benefits of this seventh thesis are threefold. First, it relaxes the implausible requirement, consistent with thesis 6, that all co-bundled (maximally connected) tropes be of the same size and shape, for if
every trope $T_{F_1}\ldots T_{F_n}$ contained by a markedness trope $T_M$ were the same size as $T_M$, then, by the
transitivity of being equal in size, each of $T_{F_1}\ldots T_{F_n}$ would be of equal size. But this wrongly
precludes variously sized bundle-mates.

Second, the fact that markedness tropes outstrip in size their contained bundles allows for the possibility of co-located objects. This will be discussed further below.

Third, the fact that the difference in size between markedness tropes and their contained bundles may be arbitrarily small allows distinct material objects to be arbitrarily close to one another even though they are contained within distinct larger markedness tropes, respectively.

The fact that the difference in size between markedness tropes and their contained bundles may be arbitrarily small is represented in Figures 1 and 2 by the inclusion of the inset detail images, which focus on those parts of the markedness tropes that outstrip the characterizing tropes contained. (These areas of difference are the parts labeled ‘tabs’, ‘maps’, and ‘strips’—terminology to be explained below.) Shading represents markedness; diagonal and wavy lines represent characterizing properties $F$, $G$, $H$, and $K$, respectively. The dotted lines leading to the detail insets represent a ‘zooming in’ mechanism, which may be understood as having arbitrarily great magnifying power since the difference in volume between the markedness trope and its contained bundle may be arbitrarily small.
8. The containment of characterizing tropes by a markedness trope $T$ may be determined by less than $T$’s entire shape. An arbitrarily small and appropriately shaped tab protruding from $T$’s boundary is sufficient. As a heuristic, we may identify a given tab by the predicate that expresses the relevant property. This heuristic is represented in Figure 1. Maximally connected spherical particle $a$ has two properties, F and G. But its F and G tropes are not co-located. Rather, half of $a$ is F and half is G. $a$’s F and G tropes are bundled in virtue of a maximally connected markedness trope having an ‘F’ tab and a ‘G’ tab.

Moreover, the shape of the markedness trope responsible for the $a$ bundle determines where within it the respective F and G tropes are contained. In addition to its ‘F’ and ‘G’ tabs, the relevant markedness trope has an arbitrarily small protrusion that replicates the basic shape of the markedness trope. In Figure 1, the relevant markedness trope is almost perfectly spherical.
(save for its arbitrarily small tab protrusions), so the replicate protrusion is likewise spherical. The information that a certain characterizing trope is located at such and such a place within the markedness trope is represented by an unmarked void—a lack of markedness—at the corresponding place on the replicate protrusion. Let us call these replicate protrusions ‘maps’ since they provide geographic information. Each map is linked with a tab and thus with a property. In figure 1, the map co-protruding with the F tab indicates where within the greater markedness trope the relevant F trope is located. Since the spherical map has an unmarked hemispheric void along the lower right, particle a has an F trope at its lower right hemisphere.

Tabs play two important roles. First, they make clear how one maximally connected markedness trope T can contain different characterizing tropes of various shapes and sizes even though T’s shape subvenes each of the relevant characterizing properties. Second, tabs allow for co-located bundles. There may be arbitrarily small multi-tab “strips” at the boundaries of markedness tropes from which multiple property tabs protrude. Just as tabs correspond to properties, so each strip locally subvenes all and only the properties whose correspondingly shaped tabs protrude from it. This idea is represented in Figure 2. Though particles b and c are co-located, b exemplifies only properties F and G while c exemplifies only properties H and K. This is because the “b” strip has an F tab and a G tab, but no H or K tabs, while the “c” strip has H and K tabs but no F or G tabs.

Two objections to co-containment bundling for CC tropes are worth forestalling. If particles can be point-sized, then the difference in volume between any such particle and the markedness trope that contains it would outstrip the volume of the particle itself. This presents a problem at worlds that contain many point particles in arbitrarily close proximity to one another. Specifically, such particles could never get closer to one another than the shortest distance
allowed by the necessarily non-zero volumes of the relevant tabs, strips, maps, etc., that account for their property exemplifications. But, the objection goes, this constraint is ad hoc. Why couldn’t point-sized material objects be arbitrarily close to one another?

I have two responses to this objection. First, maximally connected markedness tropes may be large and contain myriad complexly arranged characterizing tropes. At the upper limit are worlds with one great monistic markedness trope whose tabs fix all qualitative facts. This allows many point particles to be arbitrarily close to one another because the relevant tabs are located beyond any instances of characterizing properties. No ad hoc constraint on qualitative possibility arises.

The second response to the point particle worry is to deny that there could be point-sized material objects. I argue for this thesis in my (2012a) and show that rejecting point-sized material objects is consistent with accepting pointy spacetime in my (2012b). I will not rehearse these arguments here, but the basic thoughts are that point-sized property instances can be explained away in terms of causal roles with respect to extended property instances, and that extended objects in pointy spacetime may be understood as ‘exactly occupying’ multiple equi-voluminous regions.

The second objection is that co-containment bundling cannot allow material objects to move or undergo qualitative change. This objection is confused. Just as maps encode geographic information for bundled tropes across space, so they encode geographic information across time. A maximally connected markedness trope T may have a map that places an F trope at one spatial location within T at an earlier time and at a distinct location at a later time. Similarly, a maximally connected markedness trope may have a map that places an F trope in the bundle at an earlier time and another map that places a G trope in the bundle at a later time, such that the G
trope “replaces” the F trope in space across time. This information is encoded in the shape of a given characterizing property’s map along the temporal dimension. The “dynamics” of global markedness distribution across time will not be detailed here, but the idea is that the global spatial distribution of markedness at a given time is metaphysically responsible for the global spatial distribution of markedness at the next moment. This is just the diachronic aspect of the metaphor that markedness is a binary code for fundamental ontology.

With the eight theses in place and the two objections discharged, the co-containment view can finally be stated more precisely than in the above first pass:

(Bundle) At arbitrary world \( w \), some CC tropes \( T_{F_1}, \ldots, T_{F_n} \) are bundled as a fundamental object just in case:

(B.i) there is some maximally connected markedness trope \( T_M \) of shape \( S \) such that every part of each \( T_{F_i} \) is in contact with some or other part of \( T_M \) excluding its boundary;

(B.ii) \( S \), which may involve myriad tabs, maps, and strips, is within the range of markedness trope shapes upon which the properties \( F_1, \ldots, F_n \) locally supervene; and either:

(B.iii.a) there is no characterizing trope \( T_Q \not\in \{T_{F_1}, \ldots, T_{F_n}\} \) such that every part of \( T_Q \) is in contact with some part of \( T_M \) other than its boundary, or:

(B.iii.b) \( T_M \) has as a part some strip \( Z \) whose tabs are shaped such that they collectively locally subvene all and only the properties \( F_1, \ldots, F_n \).

5. An Application: Vindicating Resemblance Classes

In this section, co-containment bundling for CC tropes is used to discharge an objection to trope theory raised by David Manley (2002). Manley holds that general predicates like ‘colored’, ‘pale’, and ‘reddish’ pick out highly natural properties and that consequently the trope theorist ought to be able to class color or pale tropes together using her lone available resource for forming classes, degree of primitive resemblance. The problem is that Manley has devised clever
versions of co-extension and imperfect community worries that seem to show that the desired classes cannot be formed. If his objection is sound then trope theory, given thesis (ii) (the thesis that properties are resemblance classes of tropes), is refuted. I suppress the details of Manley’s examples, but the upshot is that general properties of the sort mentioned allow for cross-cutting resemblances of equal degree that preclude intuitive class constructions. For example, the trope theorist wants to class pink and pale blue tropes as ‘pale’ to the exclusion of non-pale purple tropes, but she cannot do so because the purple tropes—qua ‘reddish’—resemble the pink tropes, and—qua ‘bluish’—resemble the pale blue tropes, just as much as they resemble one another qua ‘pale’.

One might respond to this worry by urging that general predicates like ‘colored’, ‘bluish’, and ‘pale’ do not express properties that are natural enough for the classing problems to be metaphysically worrisome. Manley attempts to forestall this response by contending that it leaves one with no account of the resemblance facts that guide our usage of such predicates, the best such account being that the predicates do indeed express highly natural properties. So as not to beg the question against this contention, let us consider only possible worlds in which pink, blue, and purple tropes are CC (otherwise similarity across correct utterance conditions for the predicates ‘pale’, ‘colored’, and the like could be cashed straightforwardly as being a matter of complex arrangements of non-colored, fundamental CC tropes).

Fortunately, co-containment bundling has resources that Manley does not anticipate. Specifically, the theory allows that every markedness trope whose location contains that of an intuitively ‘pale’ CC trope, such as a pinkness trope, features a certain kind of tab. The deep ontological structure that underwrites the resemblance-tracking use of ‘pale’, on this suggestion, does not involve some universal property paleness, but rather the relevant class of appropriately
shaped markedness tropes. For example, a markedness trope whose location contains that of a pinkness trope will have—in addition to a tab corresponding to pinkness—both a tab that corresponds to the application conditions for ‘reddish’ and a distinct tab that corresponds to such conditions for ‘pale’, without requiring any tropes other than the relevant markedness trope and the relevant pinkness trope. The details might be spelled out in numerous ways here. One natural suggestion is that the ‘reddish’ and ‘pale’ tabs are sub-tabs of pinkness tabs, in the sense that the shapes of the former are parts of the shapes of the latter, much like a silhouette of your head is part of a silhouette of your body. Whichever way the details are developed, the co-containment theorist has an alternative basis for resemblance classing that respects the Ockhamist approach to the ontological question.

6. Conclusion

It was claimed at the outset that the new bundle theory would furnish the most conservative answer to the ontological question. A theoretical cost-benefit analysis will determine whether this was sound advertising.

The benefits of markedness bundling are numerous. It furnishes a Derived Restricted bundle theory without merely shifting the primitive down one relation to ‘compresence’, and without failing intuitions about co-located objects or variously located bundle-mates. It answers the ontological question without commitment to bare particulars, new external relations, necessary connections between distinct characterizing properties, or spacetime substantivalism. Finally, it furnishes a response to Manley’s previously unresolved objection to trope resemblance classes.
The cost is twofold. First, there is commitment to the new primitive property, markedness. Second, there is the requirement that characterizing properties supervene on markedness. Now, even if it were clear that this cost exceeds that of competing theories, it would not be clear that co-containment bundling thereby fails the cost-benefit analysis, for no other trope theory successfully addresses Manley’s objection. Yet it is by no means clear that commitment to markedness is any more expensive than the commitments of the traditional Derived Restricted bundle theorists. Primitive compresence has the disadvantage of being a new fundamental non-trope outside spacetime. Co-location requires substantivalism despite being unnecessary and insufficient for bundling.

Finally, any putative ad hockery associated with the supervenience of familiar properties on markedness is mitigated by the fact that co-containment bundling only applies to CC tropes, which at all nearby possible worlds are tropes of highly natural properties. The co-containment theory allows the familiar supervenience of less natural characterizing properties on these highly natural ones. It simply adds a new fundamental subvener.

Given the independent worries raised for its competitors, co-containment bundling fares the cost-benefit analysis well. It merits consideration as a new player in the metaphysics of property exemplification.
References


