

Gloppy Trope Bundles

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ABSTRACT: Trope bundle theories are prima facie attractive given certain problems faced by competing theories of substance and properties. They are less mysterious and ontologically costly than substratum theories, and they do not share the strange commitments of immanent universal theories (according to which items can wholly exist at distances from themselves). But trope bundle theories are not without their detractors. The three most difficult problems facing any theory of trope bundles are the bundling problem, the trope-targeted companionship problem, and the trope-targeted imperfect community problem. The first is a general problem for bundle theories. The latter two are general problems for trope theories raised in a recent paper by David Manley.

After introducing a novel conceptual scheme for understanding the metaphysics of minimal supervenience bases across possible worlds, I use it to describe a new kind of trope bundle theory. I then argue that this new trope bundle theory is equipped to solve the three aforementioned problems. If I am right then, given the problems faced by its competitors, trope bundle theory emerges as a highly attractive theory of substance and properties.

Introduction

Trope theorists of properties hold that properties are particulars capable of primitive exact resemblance. Bundle theorists of substance hold that objects are just bundles of properties. Trope bundle theorists, then, hold that objects just are bundles of particular properties. Trope bundle theories have a certain default appeal against their closest competitors, substratum theories and immanent universal bundle theories.¹ Here are three

¹ Immanent universals, characterized by being spatiotemporal, are sometimes called ‘Aristotelian’; the distinction here is with ‘Platonic’ or ‘transcendent’ universals, which (if they exist) exist outside of

quick ways to motivate this default status. First, substrata, qua possibly property-less, are unduly mysterious.² Second, substrata theories entail one more fundamental ontological category than do bundle theories. Finally, immanent universals, qua entities capable of existing at a distance from themselves, are prima facie conceptually incoherent.

There are, however, three difficult problems for trope bundles as well.³ The first is a general problem for bundle theories, the other two general problems for trope theories. If these three problems can be solved then, given the relative immodesty and mysteriousness of the substratum ontology and the controversy over the conceptual coherence of immanent universals, trope bundle theory's status as a highly attractive metaphysic of properties will be buttressed. In this paper I introduce a new kind of trope bundle and argue that it circumvents the three problems.

The Three Hardest Problems for Trope Bundle Theories

The first problem for trope bundles, which is a problem for bundle theories generally, concerns how the properties in a given bundle are to be bundled. After all, there is an important difference between a mere collection of properties and a bundle of properties. The former might be a gerrymandered bunch of otherwise unrelated entities while the latter, on bundle theory, is a unified particular object. But what, on bundle theory, marks this difference? The traditional answer invokes a primitive relation, compresence, which obtains among all and only the properties in a given bundle. Notice, however, that this

spacetime. For present purposes, I will not be concerned with transcendent universals since I am presupposing that consistency with naturalism constrains the dialectic. I will not have anything to say in this paper to those who would deny this constraint.

² I think this is a deep and important objection. For an opposing perspective see Sider (2006).

³ There are, of course, many more objections than these three that have been raised against tropes and bundles in the literature. Due to spatial constraints, however, I have limited my discussion to what I take to be the three best.

traditional answer dampens much of the above motivation for bundle theory since positing a primitive new relation is both ontologically immodest and rather mysterious.⁴

The second and third problems are general problems for tropes, whether bundled or not. These two problems stem from familiar problems for object-based resemblance class nominalisms, the companionship problem (CP) and the imperfect community problem (IC).⁵ Resemblance class nominalisms hold that properties just are classes of appropriately resembling particular entities. CP is supposed to show that such views entail the unfortunate claim that certain distinct properties might have been identical. Imagine a world in which all and only the grapefruits are purple.⁶ In this world, the resemblance class nominalist is forced to say, the property of being a grapefruit just is the property of being purple. And this is certainly implausible. IC is supposed to show that the resemblance class nominalist cannot correctly group together certain objects into resemblance classes that correspond to natural properties. Consider the gerrymandered class of all wooden, non-yellow squares; yellow, non-wooden squares; and wooden, yellow non-squares. This strange class of entities is such that all its members resemble one another to the same degree and no non-member resembles all of them to that degree. As such, the class meets the resemblance class nominalist's traditional criteria for being a property. But the "property" in question is clearly not a natural property. This is a problem since the resemblance class nominalist has no more to say about what ties the members of this strange class together than she has to say about what ties the members of

⁴ There is also a regress looming. Since trope theorists traditionally treat relations as tropes, compresence itself needs to be bundled. Whether this is a serious problem for traditional trope theories is not an issue I will take up here since the theory of tropes I will present does not invoke compresence.

⁵ CP is sometimes also called the 'coextension' problem. To my knowledge, these problems were first raised by Nelson Goodman in his (1951).

⁶ For simplicity, set aside concerns about arbitrary undetached parts of grapefruits that are purple but not themselves grapefruits.

any other property class together. In both cases, it is degree of resemblance (and only degree of resemblance) that does the tying.

It has traditionally been thought that trope-based resemblance class theories of properties circumvent both CP and IC. After all (the traditional response goes), purple tropes are not grapefruit tropes even if all and only the grapefruits are purple; and every class of like tropes is such that its members exactly resemble one another, a feature lacking in any gerrymandered collection. However, David Manley (2002) has recently argued that damaging versions of CP and IC can be raised even against trope-based nominalisms.

The plan for the rest of the paper is as follows. In the next section I introduce a new conceptual scheme for understanding “the fundamental ontological level,” and use it to introduce a new kind of trope bundle theory. In the two remaining sections, I argue that this new kind of trope bundle is equipped to solve the bundling problem, as well as Manley’s trope-targeted resemblance problems.

Glop

The well-known candidates for the role of “fundamental ontological particular” include points, extended simples, fields, and spacetime itself.⁷ I favor an alternative to these, developed in a view I call ‘glop theory’. In slogan form, ‘glop’ can be thought of as an acronym for *Grounding Local Ontological Primitive*.⁸ A quantity of glop is a gunky, intrinsically non-qualitative, spatiotemporal particular.⁹ The key to glop’s theoretical

⁷ I will often use ‘points’ as short for ‘point-sized material objects’.

⁸ I use ‘glop’ as a mass noun.

⁹ An object is gunky just in case all of its parts have proper parts. For the purposes of this paper, I do not count size and shape properties as qualitative.

fruitfulness is the room for a plurality of non-qualitative subvenient bases that glop's being both gunky and voluminously extended affords. The quantities of glop that work as fundamental "building blocks" are called 'bits' of glop. Bits qua extended are not points, qua gunky are not extended simples, qua intrinsically non-qualitative are not fields and qua "marked" (see below) are not themselves quantities of spacetime (contra monistic or "super" substantivalism).¹⁰ Bits, like extended simples but unlike points, can vary in size and shape from world to world (or even within worlds).

With an important exception that will be discussed in detail below, the only categorical properties that bits have intrinsically are spatiotemporal properties: extension and shape; all other properties supervene on primitive glop arrangement.¹¹ Bit individuation works by a primitive quantitative "cutoff." That is, for any quantity of glop g and any type of bit B_0 in world w , there is a minimum volume below which g will not be a B_0 bit in w . (In many worlds it will be the case that shapes of quantities of glop are relevant to bit status as well.) In this sense, it is pure quantity of spatiotemporal volume that—in conjunction either with a form of Humean supervenience or some alternate view of laws about bit configurations and supervenient, dependent, or emergent properties—primitively does the fundamental metaphysical work in a gloppy world.¹²

¹⁰ For a defense of monistic substantivalism, the view that spacetime is the one fundamental object in which all fundamental properties directly inhere, see Schaffer (MS).

¹¹ I say here that glop is intrinsically non-qualitative, but things are actually not quite this simple, due to the possibility of a pervasively qualitative spatiotemporal object. I will not get very deep into the glop theoretic treatment of this possibility here, but the basic idea is that the "laws" that pertain to the property-subvening roles of bits might well impact the qualitative profiles of the bits themselves. In such cases, bits (and the corresponding sub-bits) will fail to be intrinsically non-qualitative.

¹² In this paper I will remain neutral about competing theories of laws and supervenience. Hereafter I will express this neutrality rather roughly by simply talking of 'laws/Humeanism' vis-à-vis bit configurations and the properties that supervene on those configurations. I will also refrain from taking a very strong stand with regard to kinds of supervenience. For expository purposes, I will generally speak as though Humean (global) supervenience is what is at play in glop theory.

An inventory of the tropes contained in glop bit and sub-bit bundles brings to the fore an important theoretical cost of glop theory, though we will see that it is no greater than parallel costs of competing theories. The cost I have in mind is a primitive fundamental type of trope. Tropes of the relevant type ontologically *mark off* given glop trope bundles, which are otherwise comprised of only size and shape tropes, from empty spacetime. The idea here is of course metaphysical, not epistemic. My talk of ‘marking off’ is not principally about our knowledge or conception of glop as distinct from spacetime. Rather, it is about that which *makes it the case that* glop is distinct from spacetime. It is of course arbitrary what we call this special property, but ‘markedness’ or just ‘mark’ seems like a suitable name.

A mark trope is essentially spatiotemporal (as, e.g., color tropes are (plausibly) essentially spatiotemporal); that is, no mark trope can exist unless co-instantiated with both a size and a shape trope. It is important to notice that markedness is employed in glop theory not just to play the “marking off from empty spacetime” role, but also to play a crucial role in the subvenient gloppy base for all of the other extra-spatiotemporal properties in a given world. (There is no conceptual block to these roles’ being played by distinct properties, but one might as well minimize the number of one’s primitives by maximizing their utility.) So we can now arrive at our fundamental inventory of glop bit trope bundles: markedness, size, and shape.

How one spells out the role played by markedness in “marking” the difference between glop-filled regions and empty regions will depend on one’s theory of spacetime. The substantialist will say that the difference is that certain spatiotemporal regions, the gloppy regions, are primitively occupied; the relationalist will say that gloppy objects

primitively exist in a given arrangement and that correct discourse about ‘empty regions’ is guided by facts about the primitive arrangement of glop. But these are, *mutatis mutandis*, just the stories that the friend of points or extended simples would tell in order to distinguish empty from non-empty spacetime. Notice that markedness is therefore neither strange nor ad hoc, since the role it plays for either the substantivalist or the relationalist is a role that the relevant theorist needs to have filled quite independently of glop theory.

Solving the Bundling Problem

Notice that, in contradistinction to traditional trope bundles, there is no need for any mysterious compresence relation among the three tropes found in fundamental glop bit and sub-bit bundles. The need for compresence in traditional trope bundle theories arises from the contingency of the co-instantiation of the relevant tropes. Since it is possible (de re) for a goldfish to be green or frozen, we need an explanation of what holds the actual fish’s orangeness trope together with its actual temperature trope. The traditional answer, of course, is that the relevant tropes are compresent. By contrast, since every mark trope is such that it exists only as part of the primitive arrangement of glop at a given world, every particular mark trope is such that it would simply fail to exist in a different primitive arrangement; and since ‘arrangement’ here just means spatiotemporal arrangement, it follows that every mark trope has its *specific* size and shape essentially.^{13,14}

¹³ For a similar strategy for circumventing the need for compresence, see Simons (1994). The details of glop theory are importantly different from Simons’s “nuclear” approach, but the general strategy for circumventing compresence owes much to his work.

Now, there is of course still the issue of non-fundamental properties of non-fundamental objects, like a goldfish's being orange and relatively warm. How does glop theory explain the co-presence in spacetime of these "macro" tropes? Again the answer is simple and does not involve any mysterious compresence relation: these higher level tropes (weakly) supervene, in accord with laws/Humeanism, on the spatiotemporal arrangement of the bits of glop that compose the goldfish. Whenever that arrangement occurs within the jurisdiction of the relevant law or is part of a Humean regularity, those tropes will be present. There are no relations more mysterious than spatiotemporal arrangement and global supervenience required, even for non-fundamental trope co-instantiation.

I want to quickly forestall a possible objection. One might complain that glop theory, as I have laid it out here, dumps all of the explanatory work on a bunch of highly implausible primitive supervenience relations. After all, the story about our goldfish is that orangeness and warmth supervene on the configuration of tiny, non-qualitative bits of glop. The possible objection I have in mind is simply that this is a terrible theory of how higher level properties supervene in the actual world. To see that this is not a deep worry however, one needs only to recognize that the goldfish example has been simplified for illustrative purposes. Glop theory is perfectly consistent with there being a very large number of mediating sub- and supervening properties between the configurations of bits of glop and the relevant color or temperature tropes. (Notice that supervenience is transitive). Indeed there is plenty of room for all of the actual world scientific properties to fit in the relevant supervenience scheme. It is true that at some

¹⁴ Thanks to Jonathan Schaffer and Alexander Paseau for pushing me to get clearer on the details of the essential bundling of mark, size and shape tropes.

maximally fundamental level, it will just be a primitive fact that fundamental property F supervenes on how glop is arranged. For example, it might be the case that each of the fundamental properties of current physics supervenes on a type of bit of glop. If so, then this is where the theoretical economy of the supervenience strategy behind glop theory reaches bottom in the actual world. But even in this case, there is something upon which the fundamental (according to current physics) properties supervene, to wit, glop arrangement.

A further point of clarification is in order. The general strategy behind the present fundamentality/supervenience move for explaining higher level co-instantiated tropes is of course open to other theories of fundamental metaphysics than glop theory. But any explanatory power of supervenience with regard to the bundling of non-gloppy trope bundles will modally bottom out. Notice that there are worlds the possibility of which the non-glop theorist has no non-ad-hoc means of denying wherein all sorts of qualitative properties are fundamental (e.g. extended simples might be green in some worlds; points might smell like lemons in others). By contrast, the glop theorist's fundamental bundle is held together with consistency *across worlds* by the necessary type-co-instantiation of mark tropes with size and shape tropes. In short, the non-glop theorist has to invoke primitiveness twice per world in order to run the fundamentality/supervenience move across possible worlds: once with respect to the type of tropes bundled in her fundamental bundles, and once with respect to the tokens of those types. The glop theorist, by contrast, only has to invoke primitiveness with respect to the tokens. (Recall that the initial array of glop in a world is primitive.) Indeed, it is open to the relationalist glop theorist to make markedness the single fundamental trope type and to make size and

shape tokens supervene on the primitive array of mark tokens. At any rate, the general need for fewer primitive property-type-instantiation facts in order to explain bundling across possible worlds is a virtue of glop theory over its competitors.

Solving the Resemblance Problems

As noted at the outset, David Manley (2002) has recently argued that trope theory is not immune to certain versions of CP and IC. Manley's CP example for tropes concerns the relationship between more and less general properties like *being colored* and *being yellow*. Consider a world in which everything is yellow. In this world, the class of yellow objects just is the class of colored objects. Moreover, and this is the putative problem for traditional trope theories, the class of yellow tropes just is the class of color tropes. But no plausible theory of properties will identify *being yellow* with *being colored*. Manley's IC example for tropes involves a world with only three objects (or, alternatively, a collection of all the objects that "have" one of three color tropes), one is pale blue (call this object's color trope 'B'), one pink (call this object's color trope 'P'), and one dark purple (call this object's color trope 'D'). Now, intuitively, B and P are both pale, B and D both blue-ish, and P and D both red-ish. But we cannot correctly class these tropes together in a way that reflects these intuitive pairings. Take being pale, if we try to class B and P together to get the correct class for being pale, we have no way of disallowing D's admittance, for D resembles B (qua blue-ish) and P (qua red-ish) as much as they resemble each other (qua pale).

I will address Manley's CP and IC examples in turn. One response to Manley's CP is to bite the bullet and allow for contingent identification of determinate properties and their determinables in worlds like the one Manley describes. Manley finds such contingent identifications of properties "prohibitively odd," but it seems to me that this complaint, in the determinable/determinate context, is just a byproduct of anti-trope intuitions. Consider a world w_t , which is just like the actual world except that every actual instantiation of teal is replaced by an instantiation of mauve, so that, as it were, teal does not exist. In this world the property *being colored* is, according to trope theories of the kind to which Manley is objecting, identical to a certain large disjunctive property (namely, *being determinate hue #1 or determinate hue #2...or...[modulo teal]*), a property from which *being colored* is distinct in the actual world (for the big disjunction in the actual world includes teal). But it is not clear why we should agree that it is prohibitively odd to identify *being colored* with the relevant (teal-lacking) disjunctive property in w_t . For this identification is no more odd than the identification of the Empire State Building with b , where b is a possible building just like the Empire State Building save for being two stories shorter. Notice that the real issue here is about transworld identity; it is entirely independent of trope class nominalism. In short, it is plausibly the case, independently of CP, that a given determinable property (like most any other entity) will be different in certain possible worlds. And this is where one's anti-trope intuitions might take over. After all, the universal *being colored* is not itself different in different possible worlds, it is merely given different patterns of instantiation. But the trope-theoretic determinable *being colored*, by contrast, *just is* a pattern of instantiation in the relevant sense; as a consequence, it may well be extremely different in different worlds.

Indeed, in certain worlds determinable tropes may be different enough from how they are in the actual world as to be identical to one of their actual world determinates.

Notice that the preceding defense of tropes against Manley's CP is a general defense; it does not turn on commitment to glop theory. But there is another way to respond to trope-targeted CP that glop theory directly and uniquely benefits, a way that also grounds a powerful response to trope-targeted IC. The basic idea is to deny that determinable predicates express genuine properties and claim that they are semantically underwritten by disjunctions of certain genuine, determinate properties. So, for example, correct usage of 'colored' would be underwritten by a disjunction of all genuine, determinate hue properties. The distinction between this view and the disjunctive treatment of the property *being colored* mentioned above is subtle but crucial. The above move entailed that there is a genuine property that grounds the resemblance of everything in the big disjunction; the present "sparse" move does not. And this, as Manley points out, is just what is potentially problematic about the present move. The potential problem is that it is not clear what is supposed to distinguish the disjunction of genuine hue properties from other (perhaps arbitrarily formed) disjunctions of genuine properties such that the former but not the latter underwrites correct usage of the predicate 'colored'. This is where glop theory comes in handy.

Recall the glop-theoretic stipulation that sub-bits are non-qualitative. This means that every instance of a qualitative property—even determinate ones—will have some subvenient base that, in conjunction with Humeanism/laws vis-à-vis glop arrangement and bit-status-criteria, explains its occurrence. In sufficiently orderly worlds where color properties are microphysically supervenient (as they are in all worlds, according to glop

theory), the subvening glop arrangements for a given hue will resemble one another spatiotemporally, and the subvening spatiotemporal bit-arrangements for hues within a given color family will stand in resemblance relations that correspond to the resemblance relations that obtain among hues from the relevant family. The problem is thus solved, for facts about resemblance among spatiotemporal relations are the sort of resemblance facts that are plausibly primitive. For example, that a given *being eight feet from* trope resembles a given *being seven feet from* trope more than either resembles any *being five hundred feet from* trope sure seems to be a primitive resemblance fact, whether one is a friend of glop, points, or extended simples.¹⁵

Notice that this kind of move is unavailable to the non-glop trope theorist since there is no bar to there being worlds in which points, extended simples, or regions of spacetime primitively instantiate some number of determinate qualitative properties $F_0 \dots F_n$ (recall that this observation is what hampered non-glop theories with respect to the bundling problem, as well). Call the set of such worlds ‘W’. Here is a perspicuous way of seeing the point. For determinate qualitative properties F_i and F_{i+n} (for $n \neq 0$), and determinable predicate ‘ Φ ’ such that F_i is a determinate of Φ but F_{i+n} is not, the fundamental F_i (F_{i+n}) tropes in W worlds will be such that there will be no available subvenient properties that could serve to explain their inclusion in (exclusion from) the disjunction of determinate trope classes that underwrites correct usage of ‘ Φ ’. But if there are no such subvenient properties then there will be no way *simpliciter* to determine

¹⁵ Here is a possible worry: *The disjunctive collection of exactly resembling “distance” trope classes that serves as the ultimate subvenient base that underwrites our use of certain predicates, for example ‘red’, will likely be extremely vague.* But this worry is not a problem about resemblance groupings. If the predicate in question, in this case ‘red’, has vague applicability conditions then we ought to *expect* that the subvenient determinate trope classes that underwrite its correct usage will be subsumed under groupings with vague membership conditions. If the predicate in question does not have vague applicability conditions, then there is little reason to suppose that the relevant collection of trope classes will have vague membership conditions.

which F_i 's are to be included in the relevant disjunction of determinate trope classes.

There is thus a great advantage in favor of the glop-friendly trope theorist who seeks to counter Manley's CP by denying that determinables are genuine properties.

There is still a lingering problem, however: what about worlds that are not 'sufficiently orderly'? Consider a world $w_{\sim o}$, which is insufficiently orderly inasmuch as the subvenient glop bases for color properties there do not spatiotemporally resemble one another in anything like the order in which their respective supervening hues intuitively resemble one another. Specifically, in $w_{\sim o}$ there is a glop bit configuration type c upon which (deep) yellow hue #26 tropes supervene, one c' upon which (light) orange hue #9 tropes supervene, and one c'' upon which (dark) purple #1 tropes supervene; there are no other color trope types in $w_{\sim o}$. Now, though yellow #26 tropes resemble orange #9 tropes much more closely than either resemble purple #1 tropes (with respect to color), c (c') spatiotemporally resembles c'' much more closely than it resembles c' (c). The concern is that this is a counterexample to the glop theoretic means of circumventing Manley's worry about the "sparse" move. Glop bit configurations in $w_{\sim o}$ do not help us when we try to give a reason for grouping yellow #26 tropes with orange #9 tropes since the subvenient configurations for these tropes do not resemble one another as much as either resembles the configurations upon which the purple tropes supervene.

This is not so much a CP worry as it is an IC worry. The correct response to give here is just the response the sparse glop theorist ought to give to Manley's IC worry, namely, that there is no genuine property that the yellow and orange tropes have in common but the purple tropes lack (for Manley's example: there is no genuine property *being pale* that the pink and pale blue tropes have in common that the dark purple trope

lacks). Rather, there is merely a predicate, say ‘warm toned’ (or ‘pale’ for Manley’s example), that is applicable to the yellow and orange tropes yet not to the purple ones.

But whose predicate is this? Is it our predicate? Or is it a $w_{\sim O}$ predicate? Let us take the latter, more difficult case first. If among the yellow, orange and purple objects in $w_{\sim O}$ are sentient language users (or at least concept-users) with a predicate (or concept) ‘warm toned’ that applies to all and only the objects whose color tropes are in the yellow-or-orange trope class, then there must be room left for the glop theorist to try to find some bit-level spatiotemporal resemblances that explain such uses of ‘warm toned’, for there must then be further supervening facts about, e.g., these creatures’ phenomenal experiences and linguistic/conceptual history. Indeed the glop theorist can take a modal stand at this point and maintain that these further facts *must* have orderly resembling subvenient bases. After all, it is not obvious that there is any possible world in which (i) there are fundamental, non-qualitative subvenient bases for phenomenal color experiences of distinct types Y, O, and P; (ii) any two Y and O experiences are much more similar to each other than either is to any P experience; and (iii) the fundamental subvenient bases of Y and O experiences fail in every respect to resemble one another more than either resembles that of P experiences.

If, on the other hand, ‘warm toned’ is just *our* predicate then there are clearly a lot of further supervening facts available which are quite orderly, namely, all the facts that actually underwrite our correct usage of the predicate in question. The fact that resemblance relations among bit configurations in $w_{\sim O}$ do not match up with those that obtain among hues in $w_{\sim O}$ would be irrelevant. After all, there is every reason to think that, if glop theory is true, the relevant resemblance relations among subvenient bit

configurations do match up in the actual world. And the usage of the predicate ‘warm toned’ in describing the objects at $w_{\sim o}$ is, we are now supposing, just our usage. That is, if ‘warm toned’ is just our predicate, then its correct usage has to do with our hue properties, which have to do with our bit configurations. That predicate, we are supposing, also applies to $w_{\sim o}$ ’s hue properties because (and only because) those properties exactly resemble ours; but its correct usage by us does not have anything to do with $w_{\sim o}$ ’s bit configurations, since $w_{\sim o}$ ’s hue properties do not supervene on $w_{\sim o}$ ’s bit configurations.

One might worry at this point that phenomenal properties are complicating matters. I am somewhat sympathetic with this worry myself, but since Manley and others have focused largely on color properties, it has been worthwhile to engage them head-on. However, Manley does also raise his IC problem for geometric tropes, so I want to quickly highlight a glop-theoretic response in that case as well. Geometric IC is much like its color counterpart, but with equilateral triangle, right triangle, and square tropes in place of B, P, and D, and ‘triangularity’, ‘perpendicular-sidedness’, and ‘equilaterality’ in place of ‘red-ish’, ‘blue-ish’, and ‘pale’. The response strategy is the same as before. These predicates (i.e. ‘triangularity’, ‘perpendicular-sidedness’, and ‘equilaterality’) do not pick out genuine properties. They rather are mere predicates whose usage is metaphysically underwritten by facts about determinate glop configurations and supervenience. For example, every object that is correctly described as ‘triangular’ is such that it has gloppy parts that are arranged in a determinate configuration that primitively resembles, at least to degree d , the configurations of all other ‘triangular’ objects, where every ‘triangular’ object resembles every other to d , and where there is

nothing to which ‘triangular’ does not apply that resembles everything to which ‘triangular’ does apply to d (or higher).¹⁶

There are two final observations worth making in connection with geometric IC. First, on glop theory, it is necessarily the case that every shape trope will belong to an infinitely large class of exactly resembling tropes. This is a consequence of the gunky and voluminously extended features of glop theory. It follows from this observation that there will never be a bottom-level subvenient base for correct applications of ‘triangular’ and other shape predicates. The lack of a bottom level in this particular case, however, poses no IC-style problems, for the arrangements of glop that underwrite any two correct uses of shape predicate ‘S’ will resemble one another in the manner needed to solve Manley’s IC quite independently of there ever being a fundamental level of shape tropes. The lack of a fundamental level for shape trope supervenience does not preclude there being sufficiently resembling features among subvening bit configurations at some level or other.

On to my second observation about geometric IC. As alluded to above, Manley raises color IC two different ways. The first involves a world with only three objects, one each of B, P and D. Manley calls this the ‘restricted world’ version. The second involves the collection of all B, P and D objects, and can be raised without “leaving” the actual world. Now, the second observation I want to make in connection with geometric IC is that it cannot be raised in the restricted world form against glop theoretic trope bundles. The insight here is very simple. Gloppy objects are both gunky and voluminously extended; as such, every world in which there is any gloppy object of whatever size or

¹⁶ Again, there may well be vagueness regarding the applicability of ‘triangular’; but, as before, linguistic vagueness poses no special problem for sparse resemblance class nominalism.

shape is a world in which there are an infinite number of gloppy objects of varying sizes and shapes. It follows that any world in which only three shape tropes are instantiated is impossible.

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