Donald Baxter's Composition as Identity

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In the late 1980s, Donald Baxter published a pair of important papers (1988*a*, 1988*b*) defending the radical view that identity could hold one-many, between — for instance — a thing and its parts. David Lewis briefly flirted with this view in *Parts of Classes* (1991: §3.6) before eventually accepting a diluted cousin. An impressive list of authors have since critically discussed the view under the name Lewis gave it, 'Composition as Identity' — 'CAI', for short.[1] But although citations to Baxter's papers are *de rigeur*, most authors focus primarily on the Lewisian version of the view. Baxterian CAI has received less attention.

Lewis's dominance in contemporary analytic metaphysics partly explains this phenomenon. But it isn't the whole story. Baxter's CAI is, in his own words, 'stronger and stranger' (this volume, **PP**) than even the view Lewis rejected. As the view involves novel philosophical concepts and uses familiar ones in unfamiliar ways, even the most liberal-minded philosophers can be forgiven if it gives them a bit of vertigo.

My aim here is to stabilize Baxter's vertiginous readers. My method is regimentation: clothing the unfamiliar theory in formal garb and writing down principles to characterize it.

Why regiment? First, it aids understanding, or at least a close approximation. We can manipulate the regimented notions in accordance with the rules even if we have a tin ear for the notions themselves. Second, it facilitates critical discussion by revealing theoretical commitments, highlighting choice points, and making definite predictions. It is much easier to tell if a theory has bad consequences with a formal system which makes its consequences explicit. And finally, it can serve as an implicit definition of the novel concepts, *a la* Lewis 1970. We can, of course, argue about whether the regimented theory has a realization, but we cannot doubt that it is a theory.

Lewisian CAI collapses the composition and identity relations: composite objects are identical to their parts taken together, but individual (proper) parts are in no sense identical to wholes. Baxterian CAI, by contrast, holds that *each* part is identical to an *aspect* of the whole — which aspect is identical to the whole

[1] See, e.g., Cameron 2012, Cotnoir forthcoming, Hawley forthcoming, Kleinschmidt forthcoming, McDaniel 2008, 2010*a*, Merricks 1999, Sider 2007, van Inwagen 1994, Wallace 2011*a*,*b*, Yi 1999, and many papers in this volume.

itself.[2] Understanding how this works — and why it doesn't immediately entail that my arms are identical to each other — involves understanding both Baxter's Aspect Theory (§1) and his doctrine that existence is count-relative (§2). In §3 I discuss how these come together for a Baxterian CAI. §4 finishes with critical remarks and suggestions for further research.

Though I'll draw on later work (1989, 1999, 2001) to help, Baxter 1988*b* is my primary source. I do not promise my discussion will be faithful to everything Baxter says later. (His 1988*a*, as I read it, is a less developed precursor to the 1988*b*, and when they seem to conflict I take the latter as canonical.)

1 Aspect Theory

I am both a father and a philosopher. As a father, I spend too much time thinking about philosophy. As a philosopher, I don't. If you knew me as well as I do, you'd know these are plain, down-home truths about me.

How do we analyze these truths? We might think there are two different properties — *thinking about philosophy too much as a father* and *thinking about philosophy too much as a philosopher* — and that I instantiate only one of them. We might instead think there is one property — *thinking about philosophy too much* — and instantiation is relativized to, for instance, fatherhood and philosopherhood. Or we might think there are two different objects — Jason-as-philosopher and Jason-as-father — and only one instantiates the property.

Following Baxter, we'll call the kinds of objects involved in the third analysis *aspects*: Jason-as-philosopher is an aspect of me. (We call non-aspects 'unqualified'.) Baxter argues at length (1988*a*: 203–206 and 1999) for the third option, but with a twist: Jason-as-philosopher and Jason-as-father aren't *different* objects. They're both me. But although these aspects are both me, they needn't share exactly the same properties with me, or with each other. There are thus cases of self-differing: I differ from myself by having aspects that differ from each other.

1.1 Talking About Aspects

Since Aspect Theory allows for self-differing, Leibniz' Law is going to fail, and so it's hard to predict, in advance, how this theory will play out. We have no hope of getting it under control unless we first have a systematic way to talk about aspects.

[2] Baxter also endorses a non-distributive form of collective identity (1988*b*: 208–209), but with a distinctively Baxterian twist. See §3.3.

Our initial language will have names, variables, predicates, and truth-functions; we'll add quantifiers later. If α is a term (name or variable) in our language, call it *regular*. Here's a new bit of notation: if α is a regular term and $\phi(y)$ any formula open in y, let $\alpha_y[\phi(y)]$ be an *aspect term*. For instance, 'Jason$_y[y$ is a father]' is an aspect name — a name for me-as-father.[3]

Aspect terms are, unsurprisingly, terms. If α is a regular term and $\psi(y)$ a well-formed formula, then if $\phi(\alpha)$ is well-formed, so is $\phi(\alpha_y[\psi(y)])$. For instance, since 'Jason does too much philosophy' is well-formed, 'Jason$_y[y$ is a father] does too much philosophy' is well-formed, too.

(Choice point: Can aspect-terms be used to make further aspect terms? That is, do square-brackets 'stack', so that we can have '$a_y[Fy]_z[Gz]$', for instance? The related metaphysical question asks whether aspects can themselves have aspects. For simplicity we'll assume here that aspects don't stack, though I suspect the best working-out of the theory disagrees.)

Well-formedness is one thing; referring another. Even though 'Jason$_y[y$ is an airline pilot]' is well-formed, since I'm no airline pilot, it presumably names no aspect of me. Some aspect names can be empty.

The natural way to say that an aspect-name is empty uses quantifiers, so we'll need to add some to our language. It turns out that sometimes we'll want to ignore aspects when quantifying, and sometimes we won't. To do this, we'll use different fonts for variables: variables in italics are restricted to ignore aspects, but variables in boldface are not.

Avoid the temptation to think of this convention as 'italicized variables don't range over aspects', because these variables *do* range over aspects, at least insofar as they range over things that aspects are identical to. The safest way to think about the convention is in terms of what counts as a quantified formula's substitution instance. Consider:

(1) Jason does too much philosophy.

(2) Jason$_y[y$ is a father] does too much philosophy.

Both of these count as substitution instances of

(3) $\forall \mathbf{x}(\mathbf{x}$ does too much philosophy).

But only (1) counts as a substitution instance of

(4) $\forall x(x$ does too much philosophy).

[3]Notice: in principle aspect terms could be 'open' — e.g. 'Jason$_y[y$ is a father of x]' — and so we could quantify into them. We won't be spending any time on terms of this sort here, though.

Even though (2) counts as a substitution instance of (3), it might not follow from it: If I wasn't a father, then presumably (2) would have been false even if (3) were true. Since aspect-names may be empty, we'll need a free logic, which won't license the inference from (4) to (2) without the further premise

(5) $\exists \mathbf{x}(\mathbf{x} = \text{Jason}_y[y \text{ is a father}])$,

which will be our way of saying that me-as-father exists. (We'll have a *negative* free logic, according to which all atomic sentences involving empty names — including identity sentences — are false.)

(Another choice point: Are we going to allow empty regular names? If we don't, §2 will get more complicated than I'd like, so I'll let them in. Other than avoiding some unnecessary complications this choice will make no difference in what follows.)

Under what conditions do aspects exist? Presumably, me-as-father exists but me-as-airline-pilot doesn't because I am a father but not an airline pilot. This suggests a crucial principle of Aspect Theory:

Descriptive Necessity: $\forall x(\exists \mathbf{z}(\mathbf{z} = x_y[\phi(y)]) \rightarrow \phi(x))$.

In other words, if x-as-ϕ exists, then x must be ϕ.

What about the converse — the principle that if anything is ϕ then it-as-ϕ exists? Call this

Descriptive Sufficiency: $\forall x(\phi(x) \rightarrow \exists \mathbf{z}(\mathbf{z} = x_y[\phi(y)]))$.

Descriptive Sufficiency has some odd consequences; it entails, for instance, that there is an aspect of you-as-self-identical-and-the-Hapsburgs-are-no-longer-on-the-throne, and (assuming you're not a prime number) you-as-not-being-prime. Even 'mere Cambridge change' will create and destroy aspects if Descriptive Sufficiency is right. Still, oddity is no bar to truth. And without either Descriptive Sufficiency or some suitably restricted variant we might worry there is no principled way to decide whether a certain aspect exists. Having flagged it as a potentially important choice point I'll take no further stand.

1.2 Aspects and Identity

The above apparatus is consistent with theories of aspects which sees them as distinct from their unqualified objects. But Baxter insists that things are *identical* to their aspects. I am me-as-father — and me-as-philosopher, and me-as-bipedal, and so on. That is, Baxter endorses

Aspect Identity: $\forall x(\exists \mathbf{z}(\mathbf{z} = x_y[\phi(y)]) \rightarrow x = x_y[\phi(y)])$.

If anything is x-as-ϕ, x is.

Baxter also accepts the reflexivity, symmetry, and transitivity of identity.[4] So he will accept all of:

(6) $\text{Jason}_y[y \text{ is a father}] = \text{Jason}_y[y \text{ is a philosopher}]$.

(7) $\text{Jason}_y[y$ is a father] does too much philosophy.

(8) $\sim$(Jason$_y[y$ is a philosopher] does too much philosophy).

So Leibniz' Law fails.

This is no smoking gun; Baxter is upfront about it. He writes:

> I am urging the discernibility of identicals. To say that identicals are *in*discernible is to mean that for all *a* and *b* if *a* and *b* are identical then *a* and *b* have the same properties. So when I say that identicals are discernible I mean there exists some *a* such that *a* has and lacks a property. For *a* insofar as it is one way has the property and *a* insofar as it is another lacks it.[5] (1988*b*: 205–206)

But while Baxter thinks there are Leibniz' Law failures, he doesn't think the law completely worthless. It holds so long as we're not talking about aspects, but the 'bare' things they're aspects of.

> [Leibniz' Law] is: Thing *a* has some property, *a* is numerically identical with thing *b*, so *b* has that property. I do not want to dispense with this but merely circumscribe its application. It is valid of *a* and *b* considered unqualifiedly — otherwise contradictions would be true. But it is not valid if either *a* or *b* is considered qualifiedly, that is, if either is an aspect of something. (1999: 49; cf. 1988*b*: 206)

It is easy to formulate the version of Leibniz' Law that Baxter wants to reject:

Strong Leibniz' Law: $\forall \mathbf{x} \forall \mathbf{y}(\mathbf{x} = \mathbf{y} \rightarrow (\phi(\mathbf{x}) \leftrightarrow \phi(\mathbf{y})))$

Strong Leibniz' Law is inconsistent with (6)–(8), because we can instantiate its boldface variables with 'Jason$_y[y$ is a father]' and 'Jason$_y[y$ is a philosopher]'.[6]

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[4]More precisely, he accepts these principles as formulated with boldface variables and '='. Whether he accepts the transitivity *of identity* is something we'll come back to in §4. Note also that transitivity and symmetry usually follow from Leibniz' Law, but won't follow from any of the proposed restrictions of it discussed below.

[5]Baxter often uses 'insofar' in aspect names: 'Jason insofar as he is a philosoper' is long for 'Jason-as-philosopher'.

[6]The entailment relies on the negativity of the free background logic, which lets us infer from (6) that Jason$_y[y$ is a father] and Jason$_y[y$ is a philosopher] both exist.

It's tempting to think that Baxter wants instead:

Fairly Weak Leibniz' Law: $\forall x \forall y(x = y \rightarrow (\phi(x) \leftrightarrow \phi(y)))$

But that's not clear. Consider three arguments:

Argument One:
Twain = Clemens
Twain_y[y wrote *Hucklebury Finn*] is well-known.
So, Clemens_y[y wrote *Hucklebury Finn*] is well-known.
Argument Two:
Twain = Clemens
Susan_y[y read all Twain's work] is well-read.
So, Susan_y[y read all Clemens's work] is well-read.
Argument Three:
Twain = Clemens
Twain_y[y wrote Twain's work] is well-known.
So, Clemens_y[y wrote Clemens's work] is well-known.

Fairly Weak Leibniz' Law licenses all three, but we might not want to.

We can distinguish several weaker versions of Leibniz' Law. First, say that a term *t occurs in name position* of an aspect-term if it is outside of the square brackets, and say that it *occurs in descriptive position* if it occurs inside the square brackets. For instance, in 'Clemens_y[y wrote Twain's work]', 'Clemens' occurs in name but not descriptive position, and 'Twain' occurs in descriptive but not name position. Then our three weaker laws are:

Descriptively Weak Leibniz' Law: $\forall x \forall y(x = y \rightarrow (\phi(x) \leftrightarrow \phi(y)))$, where x and y don't occur descriptive position in $\phi(x)$ and $\phi(y)$.

Nominally Weak Leibniz' Law: $\forall x \forall y(x = y \rightarrow (\phi(x) \leftrightarrow \phi(y)))$, where x and y don't occur in name position in $\phi(x)$ and $\phi(y)$.

Very Weak Leibniz' Law: $\forall x \forall y(x = y \rightarrow (\phi(x) \leftrightarrow \phi(y)))$, where x and y don't occur in descriptive or name position in $\phi(x)$ and $\phi(y)$.

Descriptively Weak Leibniz' Law licenses Argument One, but not Arguments Two or Three. Nominally Weak Leibniz' Law licenses Argument Two, but not arguments One or Three. And Very Weak Leibniz' Law doesn't license any of them.

Baxter clearly wants *at least* Very Weak Leibniz' Law. My suspicion is that an Aspect Theorist should also endorse Argument One, and thus Descriptively

Weak Leibniz' Law. After all, if 'Twain = Clemens; Twain wrote books; so Clemens wrote books' is valid — and Very Weak Leibniz' Law says it is — then the Aspect Theorist presumably thinks Leibniz' Law failures don't stem from using different names for the same unqualified object. But that suggests the Aspect Theorist should also think we pick out the *same aspect* whether we describe it as an aspect of Twain or as an aspect of Clemens. So, I will tentatively suppose that the Aspect Theorist endorses at least Descriptively Weak Leibniz' Law, and leave it to her to decide what else she want to endorse.

2 The Count-Relativity of Identity

2.1 Counts

With Aspect Theory at the ready, we're ready to develop Baxter's CAI. It starts from the thought that existence is relative to what he calls 'counts':

> Consider the express check-out line in a grocery store. It says 'six items or less'. You have a six-pack of orange juice. You might well wonder if you have one item or six items. But you would never hesitate to go into the line for fear of having seven items: six cans of orange juice plus one six-pack... In counting, we either count the whole as one, or each part as one. If we count the whole, we do not count the parts. If we count the parts, we do not count the whole.
>
> I propose that we take the fact that there is more than one way to count, as evidence that there is more than one true number of things that exist. (1988*b*: 200)

This might sound initially sound like an observation about human activity: when we count, we tend to count by sortals ('bottle', 'six-pack', etc.), ignoring what doesn't fall under them. But that wouldn't mean that 'there is more than one true number of things that exist'. After all, why couldn't we just count all the self-identical things, and let *that* be the 'one true number'? (Cf. Rayo 2003: 105–106)

Baxter is after something deeper, though; his remarks here, coupled with his insistence that 'there is a count which includes the several parts and a count which includes the whole, but no count which includes both' (1988*b*: 201), hearken back to Ryle's 'category mistake' (1949: 22): you can buy a left and a right glove, or a pair of gloves, but you're confused if you think you're buying three things. Peter van Inwagen (1998: 236–237) sees in Ryle the view that 'exist' is equivocal: there is no sense of 'exist' that covers the several parts and the whole. I interpret Baxter likewise: there is no one true number of things that exist because there is no one true sense of 'exist' we could use to calculate it. More precisely, there is no one true answer to the question because the question presupposes that material objects exist or not *simpliciter*, but they don't: 'what exists is relative to a count' (1988*b*: 201), and 'exists' is equivocal insofar as it leaves open which count it is relativized to.

If the thought seems unfamiliar, perhaps a deflationary variant can help fix ideas. Some philosophers think the world ultimately consists of 'stuff' spread throughout regions, with no privileged division of this stuff into distinct, countable 'things' (Jubien 1993, 2009; Einheuser 2011). Nonetheless, we can in thought divide the stuff into things. Perhaps we think of the stuff over there as three separate things, with thus-and-so boundaries, and the stuff over here as a single thing, with such-and-such boundaries.[7]

On these views, we choose how to carve stuff into things. Each choice *imposes* an ontology on the world, and we can represent these different choices of ontology with different quantifiers. If '$\exists_c$' corresponds to one choice and '$\exists_d$' to another, then '$\exists_c xFx$' will be true if the *c*-choice carves a boundary around some F stuff, and '$\sim\exists_d xFx$' will be true if the *d*-one doesn't.

Baxter calls these choices 'counts', both because they determine how many things exist (according to the choice), and because they determine which parcels of reality 'count' as single things. Baxter's account differs from the above only by rejecting its deflationism: counts aren't things we project onto the world, but are part of its fundamental metaphysical structure.

Count-relativity is thus a form of 'ontological pluralism' (McDaniel 2009, 2010*b*, Turner 2010, 2012), using multiple quantifiers to capture the different, relativized senses of 'exist'. Formally, our quantifiers will be tied to different counts by way of subscripted indices — I'll use 'c' and 'd', with or without (further) subscripts. '$\exists xFx$' and similar are longer well-formed, but the corresponding '$\exists_c xFx$' and similar are. Informally, I'll use 'c' and 'd' to talk about the counts associated with respective quantifiers.

If we have multiple inequivalent quantifiers we must be careful about their inference rules. In particular, we cannot deduce 'Fa' from '$\forall_c xFx$', or '$\exists_c xFx$' from 'Fa', without the premise '$\exists_c x(x = a)$'. (Cf. Turner 2010: §5)

7Einheuser (2011) argues that the deflationist should think we must do more in thought than simply chop stuff into chunks. I agree, but the subtleties won't matter here.

2.2 *Count Relativity and Aspects*

The principles of §1 were written with unindexed quantifiers; we'll need to rewrite them now. Most of these principles involve multiple quantifiers. Are we allowed to 'mix' indices in these principles, or must all the quantifiers in any given principle be tied to the same count?

This technical question relates to a metaphysical one: If an object doesn't exist in one count, might it still have an aspect that exists in that count? I'm not aware of Baxter anywhere explicitly addressing this question, but it's clear from his 1988*b* that he thinks it can't. As a result, and with one exception, we can endorse any of the principles from §1 even when their quantifiers are tied to different counts. For instance, Aspect Identity becomes

Rewritten Aspect Identity: $\forall_c x(\exists_d \mathbf{y}(\mathbf{y} = x_z[\phi(z)]) \rightarrow x = x_z[\phi(z)])$,

(where 'c' and 'd' can be replaced for any count-terms we like).

We can *say* that aspects follow objects in counts with:

Count Coordination: $\forall_c x(\exists_d \mathbf{y}(\mathbf{y} = x_z[\phi(z)]) \rightarrow \exists_d y(y = x))$.

If we add an inference rule that lets us move from $\exists_c \mathbf{y}(\mathbf{y} = a)$ to $\exists_c y(y = a)$, this follows from Rewritten Aspect Identity.[8]

Descriptive Sufficiency, if we endorse it, forms the one exception to our policy. If we allowed its quantifiers to be tied to different counts, we could use an object in any one count to form an aspect in any other, which by Count Coordination would put every object in every count. We can, however, endorse a variant of Descriptive Sufficiency where both quantifiers are tied to the same count.

One upshot of Count Coordination is that if $\mathbf{a} = \mathbf{b}$, then $\mathbf{a}$ and $\mathbf{b}$ exist in the same count. As a result, the identity relation '$=$' can be thought of as a kind of intra-count identity — and indeed, Baxter often calls it that.

3 Composition as Identity

Let's start with an example. Here is Baxter's:

[8] Suppose $\exists_c x(x = a)$ and $\exists_d \mathbf{y}(\mathbf{y} = a_z[\phi(z)])$. We need to show $\exists_d y(y = a)$. By Rewritten Aspect Identity, $a = a_z[\phi(z)]$. But since $\exists_d \mathbf{y}(\mathbf{y} = a_z[\phi(z)])$, by (pluralist) existential generalization, $\exists_d \mathbf{y}(\mathbf{y} = a)$. So by our new inference rule, $\exists_d y(y = a)$.

> You are showing a child an orange then its parts. First you say, 'Here is an orange. It's juicy inside but not outside.' After peeling you say, 'Here is the inside of the orange — it's juicy. And here's the outside — it's not juicy.' In the before case, you are talking about one thing, the orange. The orange inside is one way and the orange outside is another... In the after case, the inside of the orange is one thing that is one way, and the outside of the orange is a second thing that is another way. (Baxter 1988*b*: 206)

Let's call the orange 'Otto,' the peel 'Peely,' and the juicy inside 'Innie'. (See figure 1.) Peely and Innie are clearly parts of Otto. In the before case, we're

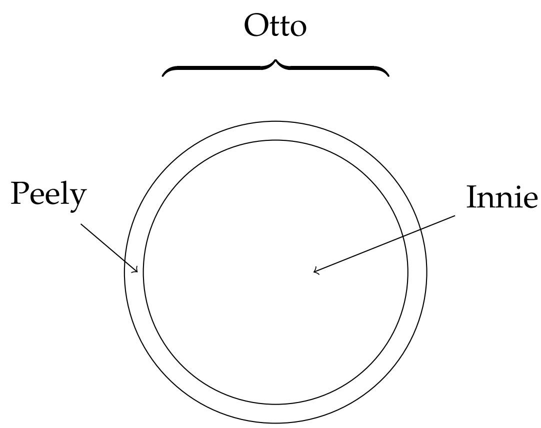

Figure 1: Otto and parts

talking about Otto. According to Baxter, wholes and parts never exist in the same count. So in the before case, we must be talking in a count that includes Otto but excludes Peely and Innie.

If it excludes Peely and Innie, what are we doing when in the before case we talk about 'the orange outside'? Baxter says this is short for 'the orange insofar as it occupies the location of the peel,' (Baxter 1988*b*: 206). So we're talking about aspects of the Orange — aspects tied to location. Let P be Peely's location and I Innie's; then in the before case, we're talking about Otto-as-occupying-P and Otto-as-occupying-I. Using '@' as a shorthand for 'occupies', we're talking about $\text{Otto}_y[y@P]$ and $\text{Otto}_y[y@I]$.

The move to CAI consists in *identifying* $\text{Otto}_y[y@P]$ with Peely. But this identity can't be the *intra-count* identity '$=$' discussed above, because Peely and $\text{Otto}_y[y@P]$ can't be in the same count. Baxter calls this relation *cross-count identity*.

Why think cross-count identity deserves to be called *identity*? The idea is perhaps clearest from the deflationary perspective described in §2.1. Suppose c_O is a count where Otto exists, and we go searching for Peely there. Well, Peely doesn't exist in count c_O, not properly, not as such, so we won't find it. But we might think there's a way in which Peely has snuck in: Even though *Peely* doesn't exist in c_O, Peely's stuff does. It's hiding inside Otto.

In c_O we cannot find anything that exactly occupies P.[9] But we can find something that *covers* P — something that occupies P and more besides. It's Otto. Otto contains all Peely's stuff, and more.

If we had a way, while staying in c_O, to focus just on the stuff inside P, that would be a way to indirectly think about Peely within in c_O. But we do: $\text{Otto}_y[y@P]$ lets us focus on exactly this stuff. Since '$\text{Otto}_y[y@P]$' and 'Peely' seem to be ways of getting at the same stuff from the perspective of different counts, it's not too much of a stretch to say they are *identical*.

That, at any rate, is the main idea. Let's sharpen it up a bit.

3.1 Regions

Baxterian CAI relies heavily on occupation relations. We should make its occupational commitments explicit. Capital letters will be terms (names or variables) for regions. Regions' existence won't be count relative, so we won't quantify over them with count-relative quantifiers. We might as well quantify over them with unsubscripted '$\exists$' and '$\forall$', since those aren't being used for anything else right now. We'll also need a subregion predicate '$\subseteq$' along with the 'occupies' predicate '@' from above. And for simplicity we assume that regions don't have aspects: '$R_y[\phi(y)]$' isn't well-formed.

Our earlier use of '@' treats it as what Josh Parsons (2007: 203) calls *pervading*: if I pervade a region, then I fill all the region and perhaps more besides. We can also define a notion of *exact occupation*:

Exact Occupation: $\mathbf{x}@!R =_{\text{df.}} \mathbf{x}@R \wedge \forall S(\mathbf{x}@S \rightarrow S \subseteq R)$.

In other words, **x** exactly occupies R iff it occupies (pervades) R and no other region other than R's subregions.

Following Parsons (2007: 205), we'll endorse two principles about location:

Exactness: $\forall_c \mathbf{x} \exists R(\mathbf{x}@!R)$[10]

[9] At least, no unqualified thing; see §4.1.

[10] My statement of exactness differs from Parsons, in that mine implies that everything (ranged

Functionality: $\forall_c \mathbf{x} \forall R \forall S((\mathbf{x}@!R \wedge \mathbf{x}@!S) \rightarrow R = S)$

Thus each material object (and aspect) exactly occupies just one region. I will call this region its *location*, and say it is *located at* this region. We also assume that everything occupies all subregions of its location. Call this principle *Inheritance*.[11]

3.2 *Cross-Count Identity*

With these resources sorted, we can get to the main business. Baxter takes cross-count identity as a primitive notion, but wants it to behave in a certain way. It ought to be reflexive, symmetric, and transitive; let's take these as read. More importantly, though, parts in one count are meant to be identical to wholes-as-located-at-the-part's-region in another. Peely is meant to be cross-count identical to $\text{Otto}_y[y@P]$ precisely because Peely is located at P.

Using '$\approx$' for cross-count identity, the principle we want reads:

Cross-Count: $\forall_c x \forall_d y \forall R((x@!R \wedge y@R) \rightarrow x \approx y_z[z@R])$

(Notice: This doesn't say that x is cross-count identical to y-as-*exactly*-occupying-R — for y may not exactly occupy R, and if it doesn't, then by Descriptive Necessity, there is no such aspect of y.)

We might think that, if $\approx$ is really an *identity* relation, it should obey some version of Leibniz' Law. Baxter agrees; he writes:

> Let me [stipulate] that in my mapping, [aspect of the whole] must exactly resemble [aspect-free part], in every way that does not entail that [whole] and [part] exist in the same count, or are identical with the same things. (Baxter 1988*b*: 208)

Call $\phi(x)$ *purely qualitative* iff it is (i) open only in x, (ii) contains neither '$=$' nor '$\approx$', (iii) contains no count-relativized quantifiers, and (iii) is with x both nominally and descriptively bare in it. Then Baxter's stipulation corresponds to

Cross-Count Leibniz' Law: $\forall_c x \forall_d \mathbf{y}(x \approx \mathbf{y} \rightarrow (\phi(x) \leftrightarrow \phi(\mathbf{y})))$

for purely qualitative $\phi(x)$.

over by the boldface variables) is located, and his does not. Since the boldface variables are only meant to range over material objects and their aspects, this difference won't be important below.

[11] In the interests of space, this section rides roughshod over a host of complex issues; cf. Hudson 2005: ch. 4 and McDaniel 2007.

3.3 *Parthood and Many-One Identity*

Neither parthood nor any other mereological notion is primitive for Baxter. But we can define parthood using cross- and intra-count identity. Baxter writes:

> The identity of part with whole is really the cross-count identity of part with whole as in sub-location, and then intra-count identity of that with whole. So the identity between part and whole *seems* to be between two things considered unqualifiedly, but it is so only by the mediation of identity with something considered unqualifiedly — i.e. the whole as in sub-location. (Baxter 1988*b*: 214)

This means we can define a parthood predicate by:

Parthood: x is a (proper or improper) part of $y =_{\text{df.}} \exists R(x \approx y_z[z@R] \wedge y_z[z@R] = y)$.

Notice that, in this definition, parthood only holds between 'bare' things: aspects neither are nor have parts.

We can now see why the view doesn't make my arms identical to each other. Each of my arms is cross-count identical to an aspect of me, and those aspects are intra-count identical. But although cross-count and intra-count identity are each transitive, their mixture isn't, so there's nothing forcing us to cut out the middlemen and make my arms identical.

If we allow plural quantification, we can also define a notion of many-one identity. As with singular quantification, plural quantification over material objects will need to be indexed to counts.[12] That's enough to get us a sort of 'automatic', distributive kind of many-one identity: the Xs are (distributively) many-one identical to y if and only if each of the Xs is identical to an aspect of y.

But this kind of cross-count identity is weaker than we want. Consider a count with Peely, and then two (exhaustive) parts of Innie: Lefty and Righty. Each of Peely, Lefty, and Righty is cross-count identical with (an aspect of) Otto. So Peely and Lefty are each cross-count identical with (an aspect of) Otto, making the collection with just Peely and Lefty many-one identical, in this sense, with Otto. This doesn't quite capture the idea behind many-one identity though, for *part of Otto* (namely, Righty) *is missing*.

[12] I have ignored plural quantification thus far. It introduces further complexities (do pluralities have aspects?) that I can't address here. But we'll consider it long enough to discuss the sense in which, for Baxter, identity is 'many-one'.

We can define a stronger version of many-one identity that doesn't leave bits out. If we use '$\approx$' ambiguously for both the singular/singular and singular/plural relations, we define the singular/plural one by:

Many-One Identity: $\forall_c X \forall_d y (X \approx y =_{\text{df.}} \forall_c x (x \text{ is one of } X \leftrightarrow \exists R (x \approx y_z[z@R])$.

In other words, the Xs are strongly many-one identical to y only if they're weakly many-one identical and don't leave out anything (in their count) that (an aspect of) y is also cross-count identical to.

4 Critical Discussion

4.1 *Saying Enough*

In Baxterian CAI, parthood relations are supposed to track subregion relations. Cross-Count gives us a sufficient condition: it guarantees that, if x's location is a subregion of y's, then x is a part of y. But we want the converse, too: if x is a part of y, then x's location should be a subregion of y's.

We haven't quite said enough to guarantee this. Suppose Freddy is a ghost located at R_f and living in one count, Daphne is a ghost located at a non-overlapping R_d and living in a different count, and there are no other counts or unqualified objects. If R_d^- is a subregion of R_d and R_f^- a subregion of R_f, nothing blocks Freddy being cross-count identical to $\text{Daphne}_y[y@R_d^-]$ and Daphne being cross-count identical to $\text{Freddy}_y[y@R_f^-]$. (See figure 2.)

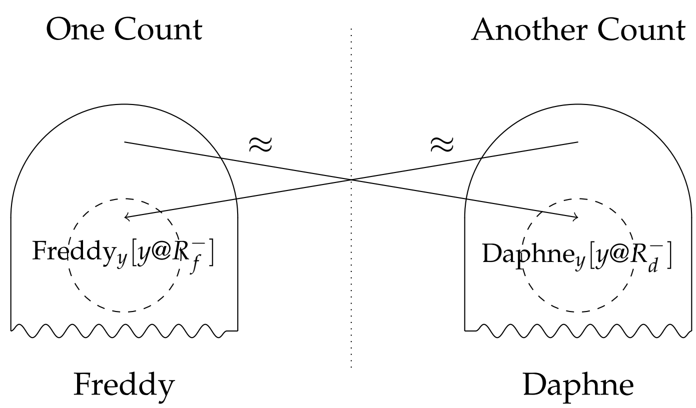

Figure 2: Mismatched $\approx$

The gap is easy to close. Thanks to Cross-Count Leibniz' Law, a part's location is the same as the location of the aspect it's cross-count identical to. So in this case, $\text{Daphne}_y[y@R_d^-]$ would be located at R_f and $\text{Freddy}_y[y@R_f^-]$ would be located at R_d. This suggest we can block the counterexample by insisting that regional aspects are located at their respective regions:

Aspect Location: $\forall_c x \forall R(\exists_d \mathbf{z}(\mathbf{z} = x_y[y@R]) \to x_y[y@R]@!R)$

And this does the trick: given Aspect Location, parts must be located at subregions of wholes.[13]

4.2 *Mereological Principles*

How, in Baxter's system, does the defined notion of parthood behave? Not very well, unfortunately; it isn't even guaranteed to obey the axioms of 'minimal mereology' (Varzi 2009: §2.2). It *is* transitive and reflexive,[14] but it need not be anti-symmetric. Suppose there's one count with one thing located at R, and another count with a different thing located at R. Then these two things will count as parts of each other, but can be (numerically) distinct. It also needn't obey most other mereological principles. For instance, supplementation principles can fail: if we made Daphne's location a subregion of Fred's but left everything else about the above case alone, Daphne would be Fred's only proper part.

We could strengthen the mereology with additional principles. Aaron Cotnoir (forthcoming), for instance, considers a plenitude principle according to which every partition of space correspond to a count.[15] Such a principle would solve worries about supplementation. And a principle saying that any x and y both located at a single region are numerically identical would deliver anti-symmetry.

Whether a friend of Baxterian CAI should endorse these principles is a separate issue. Cotnoir's principle, for instance, entails that there are no empty regions: the venerable debate over the possibility of vacuums is settled by *fiat*. If we think our metaphysics should allow the theoretical possibility of empty space we'll need to find weaker principles to get our mereology in line.

[13]Suppose x is a part of z; then $x \approx z_y[y@R]$. So $z@R$, which means z is located at a superregion of x. But by Aspect Location, $z_y[y@R]@!R$, and so by Cross-Count Leibniz' Law, $x@!R$.

[14]Reflexivity: if x is located at R, then x occupies R, so $x_y[y@R]$ exists, is intra-count identical to x, and by Cross-Count is cross-count identical to x. Transitivity: if x is a part of y which is a part of z, then there are regions $R_x \subseteq R_y \subseteq R_z$ where x is located at R_x, y at R_y, and z at R_z. But by Inheritance z occupies R_x, and so x will be a part of it.

[15]More precisely, for every region R, (i) there is some count in which R is exactly occupied, and (ii) in every count either a (perhaps improper) superregion or a subregion of R is exactly occupied. In Cotnoir's system this secures classical extensional mereology, although in the current one it doesn't guarantee anti-symmetry.

4.3 *But is it* Identity?

Here's a straightforward objection to Baxterian CAI: since '$=$' and '$\approx$' don't obey (Strong) Leibniz' Law, they can't be *identity*! (Cf. Wallace 2011*a*: 809) Baxter has worked hard to answer this charge (see especially his 1999), and I'm not going to assess his efforts here. Note only that, whether we agree with it or not, Baxter's rejection of Strong Leibniz' Law is independently motivated by his Aspect Theory, and is not just an *ad hoc* fix for his CAI.

A related objection complains that Baxterian CAI violates the *univocality* of identity. The theory posits two *different* identity relations: '$\approx$' and '$=$'. But (goes the objection), identity is just identity! There can't be two![16]

A Baxterian can deny the univocality of identity, insisting there *can* be two kinds of identity. She must then say why both relations count as *identity*. Or she can accept the univocality claim, insisting that $=$ and $\approx$ are restrictions on a single underlying identity relation, $\cong$. The $\cong$ relation can hold cross- or intra-count; 'cross-count identity' is just $\cong$ holding between things in different counts, and 'intra-count identity' is $\cong$ holding within a count.

I'm not terribly optimistic about the second response. First, $\cong$ had better not be transitive, or else my right and left arms will be (in some sense) identical after all. Neither this identity nor the denial of transitivity for $\cong$ — our only options — are very attractive.

Furthermore, it's not clear how to build a theory from this suggestion. Ideally, we would want a system of axioms that, coupled with definitions for $=$ and $\approx$, yield the various principles endorsed above. But $=$ and $\approx$ code up information that we can't recover in any straightforward way from a single $\cong$ relation. For instance, if we want to say that something $\mathbf{x}$ exists both in counts c and d, we do it with

(9) $\exists_c \mathbf{y} \exists_d \mathbf{z}(\mathbf{x} = \mathbf{y} \wedge \mathbf{x} = \mathbf{z})$.

But

(10) $\exists_c \mathbf{y} \exists_d \mathbf{z}(\mathbf{x} \cong \mathbf{y} \wedge \mathbf{x} \cong \mathbf{z})$

can't say that $\mathbf{x}$ exists in both c and d, because the cross-count identity of $\mathbf{x}$ with both $\mathbf{y}$ and $\mathbf{z}$ should suffice for (10). (Perhaps $\mathbf{x}$ is a part of $\mathbf{y}$, which is in turn a part of $\mathbf{z}$.) It's unclear what we could add to (10) to give it the force of (9). The

[16] Note that various 'collapse' arguments for this conclusion, such as in Harris 1982 and Williamson 1988, won't apply here. They rely on an unrestricted version of Leibniz' Law that neither '$=$' nor '$\approx$' obey.

missing information is that $\mathbf{x}$ exists in both counts; but that was what we were trying to express in the first place.

I do not say a full formalization of the view in terms of $\cong$ can't be given. But I do not see how to give it, so I'll set that strategy aside.

The other strategy denies univocality: $=$ and $\approx$ are simply two different kinds of identity. One reason to think they are both kinds of identity is that they both share certain structural features, such as reflexivity, transitivity, and obedience to a restricted version of Leibniz' Law. Another reason can come from our native grasp of the relations. This is perhaps clearest on the deflationary version of Baxterian CAI. Consider again Otto, $\text{Otto}_y[y@P]$, and Peely. When we carve the world into an Otto-shaped chunk, we see that Otto and $\text{Otto}_y[y@P]$ are the *same thing*. After all, $\text{Otto}_y[y@P]$, if it exists, just is whatever object we've carved that occupies P — and on this carving Otto is the only candidate. So *of course* the relation between Otto and $\text{Otto}_y[y@P]$ is a kind of identity. We might gloss it as 'carving-identity'. On the other hand, when we look across the carvings, we see that the stuff in $\text{Otto}_y[y@P]$ — a sub-portion of the stuff in Otto — is the very same stuff in Peely. But since it's *precisely the same stuff*, we should think that $\text{Otto}_y[y@P]$ just is Peely. So $\approx$ is also a kind of identity. We might gloss it as 'stuff-identity'.

This line of thought suggests a further principle. Suppose that $\mathbf{x}$ and $\mathbf{y}$ both exist in a single count, and that $\mathbf{x} \approx \mathbf{y}$. Then $\mathbf{x}$ and $\mathbf{y}$ are made up of exactly the same stuff. But since they exist in a single count, and all a count does is divide stuff into object-sized bites, whatever object-sized bite we carve $\mathbf{x}$ into had better be the same one we carve $\mathbf{y}$ into. That is:

Intra-Count Collapse: $\forall_c \mathbf{x} \forall_c \mathbf{y}(\mathbf{x} \approx \mathbf{y} \rightarrow \mathbf{x} = \mathbf{y})$.

Notice that the two quantifiers in Intra-Count Collapse are linked to the *same* count; when $\mathbf{x}$ and $\mathbf{y}$ are in different counts (as Peely and $\text{Peely}_y[y@P]$ are), this needn't hold. Likewise, Intra-Count Collapse's converse has no claim on us; although Otto $= \text{Otto}_y[y@P]$, the aspect ignores some of Otto's stuff, so we're under no pressure to think of them as stuff-identical.

Intra-Count Collapse can motivate Baxter's insistence that parts aren't in the same count as wholes. If there were a count where Peely and Otto both existed, Intra-Count Collapse would tell us Peely $=$ Otto.[17] But since Peely is located at

[17]By Count Coordination, $\text{Otto}_y[y@P]$ exists in every Otto-containing count. So if Peely were in a count with Otto, it would be in a count with $\text{Otto}_y[y@P]$. But since Peely $\approx \text{Otto}_y[y@P]$, if they shared a count, then by Intra-Count Collapse Peely $= \text{Otto}_y[y@P]$, in which case by Aspect Identity and transitivity, Peely = Otto.

P and Otto isn't, if they were numerically identical we'd contradict even Very Weak Leibniz' Law.

Intra-Count Collapse has another, more disturbing upshot: no two things in a count can spatially overlap. Consider siamese twins, Jay and Sonny. They share an arm, 'Arm', located at a region A. The following claims both seem natural:

(11) Jay and Sonny each occupy a superregion of A.

(12) Some count c contains both Jay and Sonny.

But we can't have both. Suppose (11); then $\text{Arm} \approx \text{Jay}_y[y@A]$ and $\text{Arm} \approx \text{Sonny}_y[y@A]$, and so by transitivity $\text{Jay}_y[y@A] \approx \text{Sonny}_y[y@A]$. But if we have (12), then by Count Coordination these aspects share a count. And if they're in the same count, they'll be intra-count identical by Intra-Count Collapse. So by Aspect-Identity and Transitivity, Jay $=$ Sonny. Disaster; one of (11) and (12) have to go.

This is an unfortunate result; we naturally suppose that many things, including siamese twins, can share parts. We might try to get around it in various ways. Option One: Neither Jay nor Sonny has that arm; it's an entity in its own right, although under their control. Option Two: one count has Jay (who partly occupies A) and Sonny-minus (who doesn't), whereas another has Sonny (who partly occupies A) and Jay-minus (who doesn't). Either seems to me a serious cost. Perhaps the cost of Option One can be mitigated by stressing the non-mereological, functional sense in which the twins share an arm. And perhaps the cost of Option Two can be mitigated by raising doubts about the naïve thought that the twins have overlapping bodies. Just how costly these strategies are — and whether their costs are worth paying — isn't something I have tried to decide here.

5 Conclusion

Used to the univocality of existence and the ubiquity of a strong Leibniz' Law, many will find Baxterian CAI unfamiliar. My regimentation will hopefully make the view's structure clear enough that those who find its concepts foreign can nonetheless reason about it. As should be clear by now, the view is rich and complex. It raises a host of interesting questions: Do aspects stack? What are its minimal commitments about occupation? What version(s) of Leibniz' Law ought it endorse? Can we say enough to secure a well-behaved mereology? Does it have any objectionable mereological consequences? I hope to have provided tools that will help metaphysicians give these questions and others like them the care and attention that they deserve.[18]

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