Can We Do without Fundamental Individuals?*

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According to *qualitativism*, individuals aren't 'primitive', or fundamental; all fundamental facts are purely qualitative. Some reasons to believe it are narrowly scientific, stemming from (for instance) concerns about quantum probabilities (cf. French and Krause, 2006, chs. 3–4). Others may be purely *a priori*, stemming from Berkelean qualms about the very idea of an individual abstracted from qualities. But I will follow Dasgupta by focusing on a *broad* scientific argument for qualitativism. It goes like this: Since Newton on, science has only cared about the natural qualities individuals have, and not which individuals have them. Individuals are thus explanatorily idle, not earning their theoretical keep. If we can help it, we shouldn't think idlers — including individuals — are fundamental.

Can we help it? I'm not yet convinced. I worry that theories which avoid fundamental individuals fall prey to the problems that beset fundamental individuals in the first place. My goal here is to sketch my worries.

1 The Idler Argument

Dasgupta's broadly scientific argument is a theory choice argument. We generally should prefer simpler, elegant theories to complex or baroque ones. If two theories explain the data equally well but one is more 'theoretically virtuous' than another — is more simple, elegant, etc., than the other — we ought to accept the more virtuous one.

An *explanatory idler* is a feature of a theory that does no explanatory work. For instance, in Newtonian mechanics, absolute velocity was an explanatory idler: it played no role in explaining any phenomenon. Subsequent physicists preferred the 'neo-Newtonian' theory gotten by removing absolute velocity. That's because idlers are a theoretical vice. We ought to prefer theories without idlers to those with them.[1]

Principles of theory choice are *ceteris paribus*. If one theory has a virtue another lacks and *all else is equal*, prefer the theory with the extra virtue. All else is equal between Newtonian and neo-Newtonian physics, so we prefer the latter. But matters are more complex when not all else is equal. If two otherwise equally good theories each has a virtue the other lacks we'll have to do some complex balancing up.

Dasgupta's argument only relies on a weak principle of theory choice which says we should prefer *fundamental* theories without idlers to those with them.[2]

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[1] The argument here follows Dasgupta's 2009, where idlers are called 'danglers'.

[2] We can think of 'fundamental theories' as (proposed) lists of fundamental facts.

The argument runs:

The Idler Argument

(I.i) If I is a fundamental theory that posits individuals, then it has a counterpart theory Q which does not posit indiviuals.

(I.ii) Individuals are explanatory idlers.

(I.iii) If all else is equal, we ought to prefer fundamental theories that do not posit explanatory idlers over ones that do.

(I.iv) All else is equal with I and Q.

(I.v) So we ought to prefer I to Q.

If the argument is good then every fundamental individualistic theory I is bested by an individual-free theory Q, so we ought not accept any fundamental individualistic theory.

Argument are no more compelling than their premises. Start with premise (I.ii). Dasgupta (2009), extrapolating from physics, identifies two criteria he thinks jointly sufficient for idleness. One is empirical undetectability: no possible experiment distinguishes systems where the idlers are different. The second is physical redundancy: the physics pays no attention to the idlers themselves. Premise (I.ii) is justified because individuals meet both criteria. No experiment can tell whether a system has an individual a or a perfect qualitative duplicate b, and a system's evolution doesn't depend on which individuals have which physical properties.

Next, premise (I.i). To defend it we need a recipe for trading any individualist theory for an individual-free counterpart. I'll look at three attempts below. The most straightforward strategy (§2) faces a worry Dasgupta raises for it (this volume, **pp**). I'll argue the other strategies (§§3–4) either fall to the same worry or are threatened by the Idler Argument.

2 Quantifier Generalism

A theory is individualist if it says there are fundamental 'individual facts'. And a fact is an 'individual fact' if it can be expressed by a sentence that uses an individual's name — such as 'Fa' or 'Pa & Qa', where 'a' names an individual.[3]

To avoid individualism we might insist that all fundamental facts are quantificational, expressed by sentences such as '$\exists xFx$' or '$\forall y(Py$ & $Qy)$'. Then we trade I for Q by trading fundamental individual facts for their existential counterparts.[4] Call the theory Q generated this way I's *existential closure*. *Quantifier*

[3] I don't mean anything metaphysically beefy by fact-talk — I suspect what I say about fundamental *facts* can be translated as being about fundamental *truths*. But I won't bother.

[4] One method conjoins I's facts into a conjunction C, existentially quantifes into C's name positions (with a different variable for each name), and calls the result Q.

generalism holds that the fundamental theory is the existential closure of some true-but-not-fundamental theory.

Dasgupta worries that quantifier generalism can't be right. Here's why. It's natural to think that existential quantifications are grounded in their instances: the truth of 'Something is F' is grounded in an F individual (cf. e.g. Rosen, 2010, 117). More precisely (and to avoid scope ambiguities):

∃-Ground: If $\exists x Fx$, then for some y, the fact that $\exists x Fx$ is grounded in the fact that Fy.

But fundamental facts should be ungrounded — that's what it *is* to be fundamental.[5] This tells us:

Fund-Ground: For all y and P, if the fact that P is grounded in the fact that Fy, then it is not fundamental that P.

But now we can give

The Grounding Argument

(G.i) If $\exists x Fx$, then for some y, the fact that $\exists x Fx$ is grounded in the fact that Fy. ∃-Ground

(G.ii) If for some y, the fact that $\exists x Fx$ is grounded in the fact that Fy, then it is not fundamental that $\exists x Fx$. Fund-Ground

(G.iii) So if $\exists x Fx$, it is not fundamental that $\exists x Fx$. from (G.i), (G.ii)

This is a perfectly general argument that existential quantifications can't be fundamental truths. Since quantifier generalism says that some existential quantifications *are* fundamental truths, this argument rules it out.

3 Algebraic Generalism

So fundamental facts can't be quantificational. They can be of the '*Fa*', '*Pb* & *Qb*', or similar, so long as '*a*', '*b*', and so on aren't names for individuals.

Algebraic generalism is a theory where fundamental facts have these forms, but the names are names for *properties and relations*. We will treat properties as one-placed relations: the difference between a property and a dyadic relation is the same as that between a dyadic relation and a triadic relation. There are also *zero-place* relations — abstract entities that differ from properties just as properties differ from dyadic relations.

Intuitively, n-adic relations are instantiated by n things. But zero-place relations can be instantiated by *zero* things. We can think of zero-place relations as analogous to propositions or abstract states-of-affairs, and when one is instantiated we say that it *obtains*. The algebraic generalist thinks that, in the first instance, fundamental facts are of the form

[5] At least, that's how Dasgupta is thinking about it. I'm not entirely sold on grounding-driven conceptions of fundamentality, but I'll play along here.

(1) Obtains(p),

where p is a zero-place relation.

The algebraic generalist thinks that relations are algebraically related to each other. For instance, each relation has a negation, and any two relations have a conjunction. We use '$\neg$' and '$\wedge$' for them. If 'p' and 'q' are names for relations, then '$\neg p$' and '$p \wedge q$' are names for p's negation and its conjunction with q, respectively.

There are some less familiar algebraic relations, too. For instance relations have 'inversions'. If 'r' names the *attracting* relation, then '$\sigma(r)$' names its inversion, the *being attracted by* relation.[6] More importantly, there is the *cropping* relation. If r is an n-placed relation, $c(r)$ is a relation with one less place.[7]

What is cropping? At a first pass we can think of it as existential quantification. If r is the *attracting* relation, we can think of $c(r)$ as the property of *attracting something*. Likewise, if n is the *negative charge* property, we can think of $c(n)$ as the zero-place relation (or state of affairs) of *something being negatively charged*.

The algebraic generalist doesn't want us to take that gloss too literally. He says our licence to think of c as existential quantification does *not* come from $c(p)$ being fundamentally 'about' individuals having p. The explanation goes the other way 'round. We can think of c as existential quantification thanks to how it relates to the non-fundamental. Suppose, for instance, that

(2) $\exists x(Px \; \& \; Qx)$

is true. According to the algebraic generalist, its truth is ultimately grounded in

(3) Obtains$(c(p \wedge q))$.

In general, truths expressed with an existential quantifier will be grounded in zero-placed relations that have 'c's more-or-less where the original truth had existential quantifiers.[8]

The good news for algebraic generalism is that every first-order sentence can be 'translated' into a corresponding zero-placed relation. So each individualist theory I has analgebraic generalist counterpart Q, vindicating premise (I.i).

But I worry that algebraic generalism fails to play nicely with the Idler Argument in other ways. The rest of this section will explain why.

[6]There are actually two inversion relations, but they both treat two-placed predicates the same way. There is also a 'padding' relation that effectively 'adds' an argument place. The basic idea can be found in Quine 1960; the details of this particular system are spelled out in Dasgupta 2009, appendix, and elsewhere.

[7]When $n \geq 1$.

[8]'More or less' because we have to take the original truth and translate it into one that only uses '$\exists$', '&', and $\sim$' first.

3.1 Logical Double-Counting

(2) entails

(4) $\exists x P x$.

As a result, (3) should entail

(5) Obtains$(c(p))$.

More generally, logical relations between quantified claims correspond to logical relations between zero-placed properties. How should the functorese generalist deal with this?

The most natural suggestion involves *entailments* between properties. Intuitively, anything that has the conjunctive property $p \wedge q$ ought to have both p and q. So $p \wedge q$ ought to entail p, and it ought to entail q. And this ought to be perfectly general: conjunctive relations should entail their conuncts. If we write entailment as '$\Rightarrow$', we can express this as

(6) $\forall x \forall y (x \wedge y \Rightarrow x)$.

Inferences using existential quantifiers will correspond to entailments involving c. These entailments ought to make c behave in existential-quantifier-like ways. The validity of existential generalization will correspond to

(7) $\forall x (x \Rightarrow c(x))$.

Since existential instantiation is a complicated rule, c's corresponding entailments will be complicated too. But at a very rough first pass we could use

(8) $\forall x$(If $x \Rightarrow y$, then $c(x) \Rightarrow y$).[9]

If we also have a rule that says that entailment is transitive,

(9) $\forall x \forall y \forall z$(If $x \Rightarrow y$ & $y \Rightarrow z$ then $x \Rightarrow z$),

we can use (6)–(9) to conclude

(10) $c(p \wedge q) \Rightarrow c(p)$.[10]

If we also have a principle which tells us that, if one property entails another and the first obtains, the second also obtains, we can get from (3) to (5).

Everything that has an explanation has a *fundamental* explanation. If (6)–(9) are the fundamental explanation for the entailment between (2) and (4), they

[9]Ironing out the roughness requires getting clearer on what it means for relations of different adicies to entail each other. Natural proposals all make (8) unacceptable. A less risky variant restricts (8) to cases where x has a higher adicy than y.

[10]By (6), $p \wedge q \Rightarrow p$, and by (7), $p \Rightarrow c(p)$, so by (9) $p \wedge q \Rightarrow c(p)$. We're supposing p and q are both properties, so $p \wedge q$ has a higher adicy than $c(p)$. Thus by (8) (even with the previous note's restrictions) we get $c(p \wedge q) \Rightarrow c(p)$.

had better be fundamental themselves. In this case, some fundamental facts are logically complex.[11]

This means fundamental facts will make use of two kinds of logical resources. One kind shows up in the names for the relations: $\neg$, $\wedge$, and so on. The other kind is used to conjoin or negate sentences. And we will have to double up on logical axioms, too. For instance, we'll have quality-level conjunction elimination, (6), as well as a sentence-level one,

(11) If P & Q, then P.

As a result, our theory kills one bird with two stones. We generally want our theories to avoid this kind of excess, dealing with similar phenomena in one way rather than many. When all else is equal, we ought to prefer theories that have just one kind of conjunction, and one fundamental principle to handle it, rather than two.

Of course, when algebraic generalism is pitted against an individualist theory, the qualitativist will say that not all else is equal. The individualist has idlers that the algebraic generalist lacks. Avoiding those idlers may be worth the price of some logical double-counting.

Fair enough. But sauce for the goose is sauce for the gander, as they say: the individualist may well think that it's worth paying the cost of idlers to avoid this sort of logical duplication. This suggests that, when Q is the algebraic generalist's counterpart of the individualist theory I, not all else is equal between them. Premise (I.iv) of the Idler Argument does not go through, and reasonable people can prefer individualism's idlers over algebraic generalism's excess logical structure.

3.2 *The Idlers' Revenge*

As I wrote it, the Idler Argument is invalid. It needs an extra premise:

(I.ii$\frac{1}{2}$) If Q does not posit individuals, it does not posit explanatory idlers.

If Q is as lousy with explanatory idlers as I is, then its lack of individuals is no reason to favor it. But we might worry that the relations *themselves* are explanatory idlers. In that case (I.ii.b) is false and the argument doesn't go through.

Why think they're explanatory idlers? For one thing, they're *empirically undetectable*.[12] Empirical undetectability in individuals means that, if God replaced one individual for another that is intrinsically just like it, no experiment could

[11] Note that the Grounding Argument doesn't tell against (6)–(9) being fundamental — it says that *existential* facts can't be fundamental, but doesn't rule out *universal* ones being so.

[12] Compare Langton 1998 and Lewis 2009.

detect the difference. If we had a long complex sentence S that completely described an individual x, and if God traded x for an individual y that was equally well described by S, we couldn't tell the difference.

Let q be a relation and S a long sentence that completely describes it. Then S must describe, in part, how q interacts with experimental equipment and the like. So if God replaced q for a relation p that was equally well described by S, we couldn't tell the difference. Any experiment we might perform would give us the same results with q swapped for p.

If relations are also physically redundant they will meet Dasgupta's two criteria for idleness. Here's a quick argument that they are. To fix ideas, suppose that there is just one law of physics, which says that all Fs are Gs:

(12) $\forall x(Fx \to Gx)$.

According to algebraic generalism this is grounded in the obtaining of a certain zero-place relation:

(13) $\text{Obtains}(\neg c(f \wedge \neg g))$.

But since f and g are empirically undetectable, whatever evidence supports it equally well supports

(14) $\exists x \exists y(\text{Obtains}(\neg c(x \wedge \neg y))$.

So (14) has as much claim to lawhood as (12) has. In that case the individual properties f and g are themselves physically redundant: the laws only care that *some* relations are distributed in a certain way, not that f and g are. And this argument is perfectly general. If there are many and complex laws, we replace (12) with their conjunction and reason the same way.

If this argument goes through then relations are idlers, and algebraic generalism is no better off than individualism on that front. But the argument can be resisted. One natural line of resistance insists that the laws *aren't* of (14)'s form. The laws of physics are what physicists investigate, and physicists *do* care about precisely which properties figure in the laws. They would consider setups where not all Fs are Gs as physically different, even if (say) all Ps were Qs. So relations are not physically redundant.

Rather than worrying about the sociology of physics I'll grant the point: the algebraic generalist's relations are not physically redundant. Still, there is reason to think that they are explanatorily idle. In physics, explanations come by combining laws with initial conditions. For instance, we might explain why x is G by combining the initial condition of its being F with the law (12). But we could just as well explain it by combining the initial condition of x and y being an individual and a property where (i) x has y and (ii) y satisfies (14) along with g. The second sort of explanation seems just as good as the first. But the second sort doesn't care *which* relation is involved in satisfying (14).[13]

[13]Well, it cares that g is one of the relations — but that's because g was part of the explanandum. By the same token, the *first* explanation cared that it was x which had G — but again, that

Granted, that's not how *physicists* do it. They give explanations of the first sort. But so what? We can imagine a possible community of scientists that explain things in the second way, and they don't seem to be doing anything wrong. Conversely, we can imagine a possible community of scientists who insist on explanations where individuals' identities are listed in the initial conditions. That community will consider situations that swap an individual for a physical duplicate to be physically distinct. But that doesn't mean that the individuals aren't explanatorily redundant. Unless we have special reason to think that our scientists are better than their merely possible counterparts in drawing the explanatorily lines exactly where they belong there is no straightforward argument from actual scientific practice against relations' idleness.

4 Functorese Generalism

Algebraic generalism is *platonistic*, grounding 'Something is negatively charged' in facts about the property *negative charge*. Nominalists insist that there are no properties or relations and so already won't like algebraic generalism. But they can endorse a nominalized variant.

Nominalists generally trade properties and relations for coherent uses of predicates. They reject *negative charge* as an entity while still granting that some things are negatively charged. The nominalized variant of algebraic generalism trades relations for predicates and trades the algebraic '$\wedge$', '$\neg$', 'c', etc. for *predicate functors* — devices that turn less complex predicates into more complex ones. For instance, if 'P' and 'Q' are simple predicates, then '$P \wedge Q$' is a complex one that counts as their conjunction.

On this theory 'c' turns many-placed predicates into predicates with one fewer place. Zero-placed predicates are *sentences*, and can be asserted or denied. Instead of saying that a complex property obtains (as (3) did) we assert the complex sentence

(15) $c(P \wedge Q)$,

and the fact that $c(P \wedge Q)$ is taken to ground (2). Call this view *functorese generalism*.

According to functorese generalism there *are* no relations, so it avoids the idlers of §3.2. And since sentences are just zero-placed predicates, the logical predicate-forming operators are also sentential operators. So we need only one set of logical terms and one set of axioms governing them, avoiding the duplication problems of §3.1.

was part of the explanadum. Presumably our explanations of individual-involving explanandum might involve *those* individuals — individuals are 'explanatorily idle' in that they're not needed for any explanations of phenomena of which they're not an essential part. By the same token, if we give the second style of explanation, relations aren't needed to explain any phenomena of which they're not an essential part.

Although functorese generalism avoids *those* problems it faces a variant of an argument I gave against a similar view elsewhere (2011). That argument suggests that the cropping connective c is a disguised existential quantifier. In the present context the worry is that, as a disguised existential quantifier, functorese generalism faces the same problems that quantifier generalism was supposed to.

First, some background. Let $\mathcal{L}$ be a first-order language we use to describe the world in terms of individuals. The quantifiers of $\mathcal{L}$, like those in other standard quantificational languages, do two jobs: variable binding and quantification proper. '$\exists xFx$' means 'There is something that is an x such that ...'. We can break that meaning into two parts. One part means 'There is something that'. The other means 'is an x such that ...'. The first part quantifies proper. The second binds variables.

So-called *lambda abstraction languages* use separate expressions for these two parts. The symbol '$\exists_P$' means 'there is something that' and attaches to many-placed predicates to produce predicates with one place fewer. The symbol 'λ' binds variables to create complex predicates. For instance, '$\lambda x(Fx \,\&\, Gx)$' is a complex predicate meaning 'is both F and G'.

For the first step of the argument, let $\mathcal{L}\lambda$ be an lambda-abstraction language with the same predicates as $\mathcal{L}$. It should be clear that, if the fact that $\exists x(Fx \,\&\, Gx)$ is grounding in $Fa \,\&\, Ga$, then so is the fact that $\exists_P \lambda x(Fx \& Gx)$.

Variable-binding is a way of making complex predicates from simple ones. Existential truths are grounded in their instances thanks to the quantifiers proper, since the existential quantifier proper is the expression which *says* that there is an individual. The argument's second step says that, as a result, we can replace λ with alternative variable-binding resources without changing what quantifications are grounded in. In particular, we can trade λ for the functorese generalist's functors other than c. If the fact that $\exists_P \lambda x(Fx \,\&\, Gx)$ is grounded in $Fa \,\&\, Ga$, for instance, then so is the fact that $\exists_P(F \wedge G)$. After all, we haven't touched '$\exists_P$', the expression that leads to grounding in individuals.

Let $\mathcal{F}_{\exists_P}$ be the language we get from $\mathcal{L}\lambda$ with these replacements, and let $\mathcal{F}$ be the language the functorese generalist uses to express fundamental facts. Notice that they're exactly the same except that the latter replaces '$\exists_P$' with 'c'. If the sentences of $\mathcal{F}_{\exists_\mathrm{P}}$ are grounded in individuals and those of $\mathcal{F}$ aren't, it had better be because of a difference in meaning between 'c' and '$\exists_P$'.

The argument's last step points out that this conflicts with extremely plausible principles of interpretation. Individualists will assent to sentences of $\mathcal{F}_{\exists_P}$ exactly when functorese generalists assent to sentences of $\mathcal{F}$ just like them but for the replacement of '$\exists_P$' with 'c'. Consider the following very weak principle of interpretation:

(∗) If $\mathcal{L}_1$ and $\mathcal{L}_2$ are languages with all terms in common except that $\mathcal{L}_2$ has a term β in place of $\mathcal{L}_1$'s term α, and if all shared terms have the same interpretation in both languages, and if speakers of $\mathcal{L}_1$ will assent to a sentence with α when and only when speakers of $\mathcal{L}_2$ will assent to the corresponding sentence with β replaced for α, and vice versa, then α and β have the same interpretation.

According to (∗), '$\exists_P$' and 'c' have the same interpretation. But if we trade one symbol for another with the same interpretation we shouldn't change what grounds what. If sentences of $\mathcal{L}$ can't be fundamental thanks to being grounded in individuals, sentences of $\mathcal{F}$ can't be, either. If the Grounding Argument rules out quantifier generalism this extension of it rules out functorese generalism.

5 Conclusion

Is all lost for qualitativism? Not obviously. I've argued against three qualitativist theories. Here are a few ways qualitativists might respond.

- Reject ∃-Ground, rehabilitating both quantifier and functorese generalism.
- Give up on the Idler Argument and find a new way to motivate qualitativism that doesn't create problems for algebraic generalism.
- Find some fourth qualitativist theory I haven't discussed.

And there may be more.

While I have some sympathy for the first response, I can't see how the second or third would go. This might just be lack of imagination on my part, of course. But if I have to accept ∃-Ground, until I hear more about the second or third option I'm not yet ready to give up fundamental individuas.

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