

Comments: Chenyu Bu on Generativism

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1 Main points for response

Bu's paper (after the introductory §1):

§2 Looks at some operations that are generative (iterative set-formation, mereological composition, and abstraction).

§3 Assesses (a) grounding, (b) real definition, and (c) essence, and argues (using non-injectivity) that they don't provide a good account.

§4 Presents a positive theory, centring around applicative profiles and Gen^+ .

I primarily want to focus on one issue raised by Goswick in relation to the strategy proposed by Bu. In particular, it seems that Bu assumes that:

Generative Precision. We possess (or maybe “there is”) a sufficiently clear notion of *generation* (or perhaps *generative operation/construction/process*) that needs to be axiomatised.

My own feeling is that there is no such single idea.

Rather there are several generative notions that can be made sharp.

The strategy employed — presenting intuitively plausible counterexamples that *seem* to be generative — leaves the view vulnerable to presenting examples of “generative ideas” (some more cooked-up than others) that aren't captured by the proposal.

To emphasise: I think this is quite a broad problem, and it's certainly not limited to Bu's proposal. I don't think anyone has a good account here.

But the strategy invoked in the paper invites this response.

However: I think that this indicates a great place for Bu's work. It can be viewed as a possible sharpening of the notion of generation; isolating a class of generative operations that are worth further philosophical examination.

2 Objections to opponents

The primary issue concerns *non-injective* kinds of generation.

Taking a powerset (or forming a plurality into a set) is injective, given extensionality, you can't take two different pluralities and form them into a set.

Combining hemispheres via fusion is not, the north-south fusion is normally taken to be the same object as the east-west fusion.

There is also an issue with *self-generation*; abstraction operators can sometimes output the same input.

Fine's proposal (avoiding cycles) rejected because the abstraction operator # has benign cycles.

Grounding rejected because it seems like you need an equivalence relation (non-obvious for non-surjective operations like mereological fusion).

Real definition and essence rejected because:

- (i) Fails to account for partially defined operators.
- (ii) Needs to be pre-sorted by an equivalence relation.

Rough strategy:

1. Take the intuitive idea of *generative operation*.
2. Argue that (intuitively) there are examples of generative operation that aren't captured by the proposals offered (i.e. they don't satisfy the definitions offered, and so the definition is not a necessary condition). Occasionally, sufficiency is attacked too (e.g. there are operations that seem to be non-generative that satisfy the definition).

3 The positive proposal

Bu lands on the following proposal:

(Gen⁺) An operation Ω is *generative* iff:

1. Ω is *saturable*; in every operational context C , there exists a refinement D where Ω 's behaviour is representable (so every admissible function is realised by exactly one operational element), and:
2. In the saturated refinement, every realised behaviour traces a *generative path* (i.e. affords an identity explanation for the generated entity).

This, Bu argues, deals with the examples above.

Set is handled by injectivity (as with the other accounts).

Mereological fusions are handled because the same object can have different generative paths.

I feel like I have the rough idea of what's going on here, but I don't find I have a good handle on how the relevant definitions line up with more intuitive ideas. So:

Question. I wasn't totally clear on what sort of behaviour we get out of the definitions provided. I'd welcome a nice intuitive explanation of why this captures a generative idea, but perhaps this will come through in the talk! (i.e. *How* do the definitions provided achieve the effects claimed? Are there other, perhaps easier, examples of generative operations?)

Indeed, in the paper, Bu thinks that numbers can be obtained via abstracting from the natural number structure. But this didn't seem like the generative idea that we usually associate with natural numbers (e.g. when making a bootstrapping argument). So this might also be a good example to help me understand what's going on.

4 Different kinds of generation

Here's the main issue, picking up from Goswick's plea for an underlying story of generation.

I think there's *lots* of different kinds of "generative" notions.

"Generation" is a *rough idea* that can be made sharp in lots of ways (maybe via family resemblance?).

So it's not clear to me then that the strategy of providing plausible counterexamples is a good one.

However: Maybe Bu has some (metaphysical?) reasons to favour the strategy of isolating a metaphysically privileged generative notion.

Moreover: For the examples I give, if Bu's proposal can be made to work for an *even broader* class (perhaps with some tweaking) then perhaps these examples actually help the case!

Question. Are counterexamples (in particular Set^*) to the sufficiency of alternative views really non-generative?

Let's start with an example from the paper.

Set^* is what I'll call the *present-gift* operator, it takes a plurality of non-sets xx and wraps it into a set $y = \{z | z < xx\}$ and unwraps such a set y into the xx .

It's taken as an example of a non-generative operation that satisfies Fine's definition (attacking its sufficiency).

But is Set^* really non-generative?

Consider the following:

Destructoworlds. Thanos hates there being too many objects around. Every time we run Set^* , if he doesn't see any sets, he destroys all non-sets (after the operation has finished). But if Thanos sees a single impure set, he will destroy all impure sets.

In the Destructoworlds it seems to me that Set^* is generative. It's just that the modal space conspires to make sure Set^* always brings new things into being.

The example is somewhat silly (and flies in the face of some widely held metaphysical beliefs about the dependence of sets on its members) but it shows that there are at least *conceivable situations* (or perhaps *possibilities* in some very loose sense) in which we have generativity.

In fact, I'm pretty happy with the idea that Set^* is generative in *some* sense.

Why not?

Question. Can a generative operation ever reach a fixed point?

It was never clear to me whether Bu thought that a generative operation is *essentially creative*, that is: Executing the operation always makes a new object.

But fixed points are everywhere. e.g.:

- (i) Kripke's truth-theoretic construction.
- (ii) Fine-style generation of the natural numbers.
- (iii) (Just for the set-theorists) Normal functions and large cardinals.

So: Do operations that hit a fixed point count as generative? They certainly seem generative to me. They just aren't *necessarily* generative.

Question. Can I be a generativist without having pluralities be the input to an operation?

Gen⁺ — and to be fair, most of the literature — assume that the input has to be a *plurality*.

But why?

What about the following example?

The ice-cream world. In the beginning was...ice cream. Not a box of ice cream, not a blob of ice cream, but just ice cream as *stuff*. You have a single generative operation, given by... *an ice cream scoop*. You can apply this scoop to ice cream in order to generate...*a scoop of ice cream* as an object. For any scoop generated, you could scoop more, the ice cream knows no bounds.

Again, a silly example.

Perhaps you think that such ice cream would (metaphysically) have to be an object in some sense (and hence a degenerate singleton plurality) or perhaps you think that it's some plurality of objects.

But this situation (who knows if metaphysically possible) seems to be possible in *some sense*, and we are looking for an explanation of *generativism in general*, so why should it be excluded?

Question. Why think that generativism need be *functional*?

Bu assumes (via Gen⁺) that the input of a given plurality has a *unique output* (assuming it has one).

Most authors assume this, but Bu wants to provide a *general theory of generativism*, not some small part of it, and so is susceptible to the kinds of rejoinders below.

I'm fond of thinking about different kinds of generativism via the kinds of *imperatives* we can articulate.

It seems to me that there are (important!) kinds of *generativism* or *method of construction* (I'll hold off using the term "operation", as this has functorial connotations, but I could have) that seem to have either *indeterminate* or *multiple possible* outputs.

Imperative examples:

- (a) *Scoop the ice cream!*
- (b) *Extend this line!*
- (c) *Add a root for $\sqrt{-1}$!*
- (d) *Give me a forcing generic!* (important for set-theoretic potentialism)
- (e) *Construct a proof of the Fermat Conjecture!*

I couldn't resist asking Bu how this relates to some of their other work, e.g. in aesthetics:

- (f) *Complete this unfinished symphony!* (e.g. Beethoven's Symphony No. 10)
- (g) *Give Eric Cartman a sibling!*

These all seem like perfectly good notions of generation to me, with indeterminate outputs.

5 Where forward?

How should Bu respond? To make things concrete, I want to put a couple of options on the table.

Option 1. Establish that there is just one notion of “generative”.

This is a hard road.

We need to establish that somehow the examples I’ve put forward above aren’t generative.

As I’ve indicated, I personally think that “generative” isn’t captured by *any* functorial notion.

Perhaps Bu would want to say that since many are non-functorial, they should be excluded, really we are interested in the notion of *generative operation*.

So much the worse for the view, especially when some of these (e.g. the introduction of forcing generics under set-theoretic potentialism) are taken to be *metaphysically important*.

Instead, I suggest (though maybe Bu has better ideas here):

Option 2. Accept that we’re just isolating a (metaphysically important) class of generative ideas from many, and finding some of their interesting features.

This seems to me like the easier option.

Note that this doesn’t mean that it’s an anything goes affair, it might be that there are *more/less important* generative notions.

e.g. Many think there’s links between generative ideas and *potentialism about X*, on which there could always be more of *X* (*X* is often sets, or properties, or sometimes even possible worlds).

But note: If we can make this move, then the significance of the proposal is slightly weakened. Why can’t the friends of injective operations do the same?

Perhaps their generativism is best suited to a range of other purposes?

Or perhaps Bu has good reasons to think that the view offered here isolates the *most metaphysically interesting* class.

Question. Which option (if any) does Bu want to take moving forward?

Question. Are there any *metaphysical* reasons to go for *one* (of the possibly variegated) classes of “generative” method? (e.g. Is there a privileged notion for metaphysical purposes? Is there only one that is *really* generative?)

6 Summary of questions

Question 1. I wasn’t totally clear on what sort of behaviour we get out of the definitions provided. I’d welcome a nice intuitive explanation of why this captures a generative idea, but perhaps this will come through in the talk! (e.g. *How* do the definitions provided achieve the effects claimed? Are there other, perhaps easier, examples of generative operations?)

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Question 2. Are counterexamples (in particular Set*) to the sufficiency of alternative views really non-generative?

Question 3. Can I be a generativist without having pluralities be the input to an operation?

Question 4. Why think that generativism need be *functional*?

Question 5. Which option (if any) does Bu want to take moving forward?

Question 6. Are there any *metaphysical* reasons to go for *one* (of the possibly variegated) classes of “generative” method? (e.g. Is there a privileged notion for metaphysical purposes? Is there only one that is *really* generative?)