

Biological process, essential origin, and identity

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Abstract In his famous essentialist account of identity, Kripke holds that it is necessary to the identity of individual people that they have the parents they do in fact have. Some have disputed this requirement, treating it either as a reason to reject essentialism or as something that should be eliminated in order to make essentialism stronger. I examine the reasoning behind some of these claims and argue that it fails to acknowledge the complex and multi-faceted importance of biological process in determining identity and distinguishing significant differences between biological and non-biological cases. In fact, this failure derives from an inherent tendency to treat the biological case in just the same way as the non-biological case at least at one important point in its history—the point of formation. This analysis offers a way of salvaging Kripke’s original claims. I focus in particular on the views of Graeme Forbes and Teresa Robertson, but also discuss the views of Nathan Salmon, M. S. Price and E. J. Lowe.

Keywords Kripke · Origin essentialism · Identity · Biological process · Parental requirement · Graeme Forbes · Teresa Robertson

1 Kripkean essentialism and causal origin

In his famous account of identity involving a posteriori necessity outlined in *Naming and Necessity*, Saul Kripke includes causal origin as a necessary part of the identity of a person. In particular, he mentions having the biological precursors or parents that an individual actually does have as part of this causal origin (Kripke

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1980: 111f). This precursor requirement (especially the requirement of parental origin) has been thought by many to be a crucial part of an essentialist account of causal origin for individual human beings. But some have rejected any such parental inclusion.¹

In some cases, the parental requirement is simply neglected in favor of a treatment of Kripke's discussion of non-biological items like tables.² Perhaps the thought is that Kripke meant to suggest that biological items are exactly on a par with non-biological ones, or that a simple treatment of the non-biological and compositional features of items is enough to do justice to Kripke's account of essential origin. This seems to be the position of Salmon.³ In any case, the upshot of such treatment is that biological cases can be quickly and easily reduced to non-biological ones. For whatever reason, this seems to be the assumption in the most recent discussions of origin essentialism, which tend to focus on non-biological cases and exclude independent treatment of biological ones.

Graeme Forbes explicitly rejects the parental requirement, although in his article in this journal (Forbes 1980) he was not quite there yet. He has come to regard this element as a remediable defect in Kripke's view—one that can be detached from origin essentialism itself. His developed view, set forth and refined in a series of works, includes an explanation of what he considers to be the basis of the supposed parental requirement, an apparent counterexample to the requirement, and an argument that an individual's actual parents are not in fact required as part of the individual's identity—so long as something like zygote identity (in some sense) is preserved. He has been joined by Robertson (1998) in holding that the parental requirement would invalidate any origin essentialism of which it is a part. She and Forbes differ in that Forbes himself retains a kind of Kripkean essentialism about origins while she does not. She rejects origin essentialism, and some of her criticisms have prompted Forbes to refine and develop his origin essentialism further. But both agree that origin essentialism cannot include parental descent (or more generally, precursor descent) as necessary for the identity of *any* individual.

However, as appealing as some of this reasoning may at first appear, I don't think Forbes and Robertson have succeeded in showing that actual parental descent fails as a possible essentialist requirement of identity. On the contrary, I shall argue that,

¹ See Price (1982), Forbes (1986, 2002), Robertson (1998) and Lowe (2007).

² See footnote 56, Kripke (1980: 114).

³ See Salmon (1979: 706), especially where he says Kripke's argument can be generalized by "letting A be the original component material ... of some table B, whatever kind of material that may happen to be, and letting C be any distinct hunk of matter." He then goes on to suggest that sperm and egg can be treated in this way as collections of their component material and so the reasoning can apply to them. However, treating biological entities in this way (even if one adds their arrangement according to a "plan" as Salmon does) may be held to ignore a component of their origin—as biological entities themselves giving rise to a biological entity. A similar concern might be raised as to whether Kripke's use of the term "hunk" to describe the originating material for the table in question should be taken merely to mean collection of material. He does, after all, advise caution about the vagueness of "hunk", which, presumably would not be a concern if he intended it simply to mean the "collection" of the constituent material. He also talks about substance and composition in the following separate footnote. Perhaps, then, this footnote, about origin, should not be taken to be merely about the material composing the items discussed but rather about something more.

where specific parentage occurs for an individual in the actual world, it can be held to be a necessary requirement for the identity of that individual in any possible world in which the individual exists. In other words, it is possible to hold that any individual lacking that parentage, however similar in other ways to one with that actual parentage, cannot, in fact, be that very same individual. I shall argue that the key to seeing this is an examination of biological process, and that it is, as it were, a hasty or implicit a priori rejection of the importance of such an a posteriori inquiry that leads Forbes and Robertson astray.

This examination will show that biological cases cannot so easily be reduced to non-biological ones.⁴ It will also show that an assimilation of biologically originating entities with non-biological ones is the cause of difficulties that are otherwise avoidable. One major difficulty is the recycling problem, which Robertson raises as an issue, leading Forbes to propose as a solution predecessor, or order, essentialism. But order essentialism is itself problematic because, as Robertson says, it is far less intuitive than the origin essentialism it is supposed to support.⁵ As will become apparent in the following discussion, an account based on biological process obviates the need to appeal to order essentialism for biological origins and is far more in line with Forbes' own requirements for origin essentialism (namely, that in explaining intrinsic nature we avoid ungrounded identities and causal isolation). Both of these advantages give added support to such an account over one that eschews the parental requirement in favor of some kind of compositionality principle of identity, as Forbes' does. What I shall also suggest is that an account which attempts, at the start, to reduce biological identity to non-biological identity on the basis of a principle of compositionality gets things wrong as an attempt to understand what Kripke may have had in mind.

2 The case against the parental requirement

In his analysis of Kripke's essentialism, Forbes starts from what Kripke (1980: 110–113) says about the Queen of England, extracts a thesis from it, and then employs what he regards as a strategy of generating counterexamples to the original view.⁶

Kripke doubts whether the Queen could have been born to parents different from her actual ones. It is biological parents that are in question here, since of course sperm-egg transplants are quite conceivable—and presumably there is nothing modally special about human beings in this regard, as opposed to other kinds of organism. So one might extract the following general thesis from Kripke's remarks:

⁴ In more recent articles by Robertson and Forbes (2006) and others, this reductionism prompts concentration on the non-biological case to the exclusion of any investigation into the biological one.

⁵ See section 2 of Robertson and Atkins (2013).

⁶ He adapts this strategy from a counterexample attributed to Price (1982: 35).

(*K*) $\square (\forall x) \square (\forall y) \square (x \text{ originates from } y \rightarrow \square (\text{Exists } (x) \rightarrow x \text{ originates from } y))$.

But (*K*) has plausible counterexamples. Suppose *z* is a human zygote that is formed by fusion of a sperm *s* with an egg *e*. Then one can conceive that scientists synthesize a zygote by building it nucleotide by nucleotide, and happen to use exactly the actual matter of *z* in exactly its actual *z*-configuration. In such a world, *s* and *e* do not exist, or so we can consistently postulate, but it is hard to deny that *z* exists (one might say that a synthesized “zygote” is not a zygote, hence not the same zygote as *z*, but this seems strained). So *z* exists but does not originate from *s* and *e*, since they do not exist. (1986: 7)

Forbes then deals with a possible weakening of thesis (*K*) restricting its application to worlds where the zygote originates from other cells rather than being synthesized directly, in order to see if, under those limited conditions, something like thesis (*K*) can be maintained. He argues, by way of a slight modification of his original example, that even this weakened thesis, requiring origination from cells, would not escape the reasoning strategy in the counterexample.

But our scientists could surely synthesize cells—perhaps half a dozen or so—that fuse to produce the atom-for-atom replica of *z* as it actually is, which is again a situation in which *s* and *e* do not exist. (1986: 8)

The conclusion he draws is this.

These cases suggest that what is important to the identity of the organism is the identity of the matter from which it originates, together with the configuration of that matter. (1986: 8)

Let’s call the conclusion he draws from this line of reasoning the matter-configuration principle of identity from origins.⁷

Robertson follows Forbes at least in holding that the parental requirement must be rejected. She repeats Forbes’ argument and agrees that it would be hard to deny that the zygote synthesized in those various possible worlds was the same zygote identified in the actual world. She then enshrines in a principle what she considers to be the moral of counterexamples like these and enunciates a warning:

[Pb] A given zygote, *z*, that originates from a collection of precursors, *y*, could have originated from *y*’, any distinct collection of precursors that could give rise to an atom-for-atom replica of *z*.

...

Any would-be essentialist about origin does well to bear [Pb] in mind, taking care to advocate only claims that are compatible with it. (1998: 731)

⁷ It’s important to note that Forbes isn’t himself requiring that all the matter be the same, or indeed all the structure; he says that one must only require that those things not be very different (1986: 8). However, he is drawing the conclusion that, for any acceptable origin essentialism, nothing else could be involved but matter and configuration.

Robertson also says she knows of no one writing on this topic who would want to deny the principle and reports from conversation with him that even Kripke is inclined to accept such science fiction examples as genuine possibilities (1998: footnote 5, 732), although it's not clear whether she means he would accept principle [Pb] or just the possibility of the science fiction scenarios that lead Forbes and her to insist, on their basis, that origin essentialists must accept it.

What Forbes has provided (and Robertson affirmed) is an argument that origin essentialism must reject a “same parents” or “same precursors” requirement for identity in favor of a requirement of (a certain conception of) “same zygote”. The reasoning proceeds by describing a way in which it appears that a zygote can be identically the same zygote in the absence of parental or precursor identity. Sameness of material and formal constitution then becomes a sufficient condition for sameness of zygote without the possibility of any requirement of parental or precursor identity.⁸

3 Does the matter-configuration principle determine identity?

Now it is understandable that one might find something like [Pb] or the matter-configuration principle of identity from origins appealing. The underlying intuition is that the identity of the individual person depends on the identity of the zygote, and *that* identity depends on the way the zygote is—that particular collection and arrangement of matter. What could possibly incline one to doubt that?⁹

However, despite the initial appeal of this line of thought, I believe that Robertson's principle [Pb], Forbes' matter-configuration principle of identity from origins and the idea that underlies both of them are mistaken and that the mistake reveals a misconception about a potentially significant difference between correct judgments of identity for biological items and those for non-biological ones. Theories that neglect this difference may encounter difficulties that can only be addressed by modifications whose very introduction may appear ad hoc because of this neglect.¹⁰

In order to justify a rejection of the principles and the underlying idea involved here, something like a counterexample is needed. We need a case that indicates that

⁸ Subsequently, as we shall see, Forbes (2002) effectively qualifies this in light of the “recycling problem” because he feels forced to do so by an observation of Robertson's (1998). But his resultant qualification—predecessor essentialism—seems to have problems of its own, as will become apparent.

⁹ Salmon says something like this about Tables (1979: 723). The alternative he envisages is that if the tables in different possible worlds are to be different, it can only be because they differ in their bare haecceities. However, as we shall see, if the items are biological, any such difference in haecceity need not be bare or ungrounded, in Forbes' terms, because a difference in biological process will be involved. If there were a counterpart to biological process for the tables Salmon considers, then the same thing could be said there.

¹⁰ It is true that Forbes (2002, note 12) acknowledges a significant difference between biological and non-biological cases and uses it to comment on Ship of Theseus examples. However, in his discussion, any connection he makes with the crucial importance of biological process for individual identity in the biological case seems sensitive only to process in *later* development rather than in formation itself.

granting the strict material and formal identity envisaged (exactly the same atom-for-atom matter in exactly the same arrangement for the zygote) is not enough to overpower an intuition that the individual involved there is not the same as the one in the actual world.

To that end, consider this. Suppose we choose someone in the actual world, call him Al, who developed from a zygote, call it Alzy, which was the result of a sperm from his father, Alpop, and an egg from his mother, Almom. Now, consider a possible world in which, in addition to the presence of the relevant part of the actual world up to the time of Alpop and Almom (but in which, let us say, Alpop and Almom do not conceive), there is also a planet somewhere, call it Twin Alearth, which is very similar to earth and which also contains a genomically identical couple composed of Twin Alpop and Twin Almom, who are formally identical to Alpop and Almom respectively even though composed of materially different atoms (though atoms of the same kind, number and arrangement). Furthermore, suppose it is true of that possible world that Twin Alpop and Twin Almom together conceive in the usual way and produce a zygote, Twin Alzy, and that Twin Alzy is formally and materially identical to Alzy. In other words, not only is Twin Alzy formed of atoms in exactly the same way as is Alzy, but it is also formed of exactly the same atoms. Those very atoms that, in the actual world, came to compose Alzy found themselves, in the possible world we are imagining, at the right place and time on Twin Alearth to be conscripted naturally into the formation of the natural product, Twin Alzy, of a conception by Twin Alpop and Twin Almom. Moreover, suppose that Twin Alzy develops into a healthy male, call him Twin Al, who is very similar to Al. The question, of course, is whether Twin Al is Al. I believe we should say no. Even though Twin Al developed from a zygote, Twin Alzy, which is an atom-for-atom duplicate of Al's zygote, Alzy, it is not Al that resulted, but rather a different person, Twin Al. Twin Al is the child of completely different parents by way of a completely different biological process from those of Al and could not be Al. Indeed, the possible world we are imagining contains no Al. Moreover, it seems right to say that Alzy and Twin Alzy are not the same zygote because they are organisms that are the products of the different developmental processes of different biological systems and a different line of descent.¹¹ Indeed, the possible world we

¹¹ The line of descent extends beyond the generation of this entity. Suppose one were to imagine a different possible world in which Alpop and Almom do not exist because, say, their two sets of parents never had children. In such a world, then, could one perhaps say that Twin Alpop and Twin Almom respectively are, in fact, Alpop and Almom, if they are imagined to be materially and formally identical to Alpop and Almom in the actual world? If so, then wouldn't the original bar to saying that Twin Al was Al be removed? The trouble with saying this, however, is that we then have the same problem with the identities of Twin Alpop and Twin Almom that we had earlier with Twin Al. If Twin Al in the original possible world scenario could not be Al because Twin Al did not have the parents of Al as parents, then, in this imagined possible world, Twin Alpop could not be Alpop and Twin Almom could not be Almom because they do not have the same parents as actual Alpop and actual Almom, respectively. Therefore, since Twin Al is not the child of Alpop and Almom, he cannot be Al in this possible world. This reasoning can clearly be iterated as required. The only way to have Al in a possible world is by having his actual line of descent in that possible world.

are imagining contains no Alzy.¹² What this seems to indicate is that the matter-configuration principle of identity from origins, principle [Pb], and the idea underlying them are incorrect. Material and formal identity, even together, are *not* sufficient for zygote identity; instead, the process of formation is important to identity.¹³

Now suppose it is said that the matter-configuration principle of identity might be salvaged by restricting its range of application to certain kinds of zygote production—in particular, by restricting it to zygote production that does not involve different human parentage. The view here might be that parental identity (merely) trumps formal and material identity. Perhaps then, the objector might claim, the principle would allow biologically engineered material and formal zygote identity to suffice for a zygote, call it Bioeng-alzy, to be Alzy, and so to be something that could develop into Al. In other words, the objector is imagining, say, a possible world in which Alpop and Almom never conceived Alzy, but in which instead Bioeng-alzy, materially and formally identical to Alzy, is produced entirely by biological engineering. He then alleges that, since there is no alternative parentage for this zygote that could trump material and formal identity and make it something else other than Alzy, Bioeng-alzy would in fact be Alzy.¹⁴ The trouble with this line of thought is that there is no more reason to say that Bioeng-alzy is Alzy than to say that it is Twin Alzy. It would seem that the most reasonable thing to say is that Bioeng-alzy is neither of them but rather a different zygote that would, if it developed, produce a different individual person. This suggests that parentage, where it exists, is not a trump but rather a requirement. The causal biological process of production is relevant to identity.¹⁵

¹² This is true even though we might be tempted to say that Twin Alzy is, in some sense, the same *cell* (though it would be better to say: the same cellular material arrangement) as Alzy. This conception of “cell” would be better labeled as a temporal “cell stage” in a kind of Quinean sense of “stage.” But identity of temporal cell stage does not guarantee identity of cell, as is clear from the discussion of recycling and reconstitution of the same temporal stage in the discussion of the recycling problem in the next section.

¹³ Another way to conceive of a counterexample is this. Imagine a possible world in which Alpop and Almom exist on earth at the same time as Twin Alpop and Twin Almom exist on Twin Alearth. They are respectively genomically and formally identical (Alpop with Twin Alpop and Almom with Twin Almom) but made up of different atoms. Now imagine that Alpop and Almom give birth to a son Al by way of the zygote Alzy, a union of their sperm and egg, while Twin Alpop and Twin Almom do not conceive. Now imagine another possible world identical to that one except that Alpop and Almom never conceive but Twin Alpop and Twin Almom do conceive and produce a son, Twin Al, by way of a zygote, Twin Alzy, which is formally and materially identical to Alzy in the other possible world. Analogous reasoning would then produce an argument that Twin Alzy is not Alzy and Twin Al is not Al, which is contrary to the matter-configuration principle of identity.

¹⁴ This would be something like what Price (1982) imagines when she imagines that the parents of Queen Elizabeth II do not conceive (nor even produce the relevant gametes) but resort to biological engineering to produce a zygote materially and formally indistinguishable from the zygote from which the Queen actually developed (Price 1982: 35). I believe Price’s counterexample, although widely accepted, does not work.

¹⁵ Notice also that this suggests there might be significance in a difference in how the biological engineering of a fabricated zygote took place. Indirect biological engineering that resulted in cells that then produced the zygote in an organic process might be significantly different in an identity-relevant way

4 The recycling problem and biological process

Although we have just seen independent reason to reject the matter-configuration principle of identity from origins, Forbes himself eventually comes to modify his allegiance to it in response to what he calls the recycling problem (2002: 324). This problem derives from an observation made by Robertson in the course of her argument against the essentiality of biological origins. Robertson observes what she rightly characterizes as a commonplace, that biological organisms can cast off, in the process of development, the material they are at any point made of, rendering that material available for the use of other biological organisms, and thus making recycling possible (1998: 745). The “recycling problem” would then result from the possibility of reconfiguring the same material in exactly the same form. Recycling is a particularly thorny problem for a view that holds that any means of producing a materially and formally identical zygote has the same claim to producing identically the same zygote. The reason is that formally and materially identical zygotes could be produced in any of a number of ways, even *seriatim*, by reconstituting the original material in the same form via biological engineering (or as stipulated by any appropriate description of possible worlds) after it has been cast off by the original individual. Clearly, a materially and formally identical recycled zygote cannot be the same entity as the first or any earlier one, if they, or their resulting individuals, still exist at the time (with, of course, different material constituents). So, in order to prevent identity from being extrinsically determined (which would involve an unacceptable dependence of an individual’s identity on whether or not something else continues to exist), there would have to be something intrinsic to the item to distinguish individuals. To serve this role and to deal with Robertson’s recycling problem, Forbes offers order of formation.¹⁶ According to this approach, then, the first such zygote produced in any possible world must be the same as the one first produced in the actual, or any other possible, world, and so too for the second or any other in the ordered sequence of formation (and this information must be intrinsic to the individual). Forbes calls this predecessor essentialism.

Predecessor essentialism, however, clearly conflicts with the biological process requirement we have been discussing. For, even if Alzy is the first such zygote in the actual world, then, if, in the other possible world we have discussed, Twin Alzy is the first such zygote, it will still be the case that Twin Alzy is different from Alzy (because of the different processes of formation). Given the same order in sequence of formation, predecessor essentialism would require that Twin Alzy, the product of Twin Alpop and Twin Almom, was in reality Alzy and could therefore develop into Al. Moreover, it would require that Twin Alzy’s identity would change every time we added an additional materially and formally identical zygote biologically engineered to exist before it. However, predecessor essentialism is not necessary to

Footnote 15 continued

from the direct engineering of the zygote itself. In his discussion of these different cases, Forbes does not see any such significant difference.

¹⁶ As Forbes says, “in the sense of predecessor that means, when x is a propagule [a zygote is a propagule], having the same matter configured in the same way” (2002: 328).

solve the recycling problem here; biological process does that job, and with the additional advantage of not appearing ad hoc. In fact, as used here, predecessor essentialism is an attempt to solve a problem that would not really arise in the general case Forbes considers if not for an acceptance of the matter-configuration principle.

Why would Forbes even resort to a line of argument that leads to predecessor essentialism, when an account involving the biological process governing the descent of an individual from precursors will deal even better with the recycling problem? I shall examine two possibilities: (1) he might have independent reasons for opposing an account involving precursor descent,¹⁷ and (2) he might think predecessor essentialism, or the specific line he takes that leads to it, is necessary to save his argument for essentiality of origins (Forbes 1986: 8–9) from Robertson’s objection.

Let me first address (2). It’s interesting that the very criticism that leads Forbes to predecessor essentialism cannot even get off the ground if one accepts an account of identity involving precursor descent. The criticism is Robertson’s, and it is part of an attempt to show that Forbes’ argument for essential origins does not rule out other views that conflict with essentiality of origin. In fact, Robertson explicitly says that her argument presupposes a rejection of what she calls strong origin essentialism.¹⁸ The latter view looks very much like a general characterization of what I have been discussing as the biological process governed precursor descent requirement for identity. (Robertson thinks it is all right for her argument to rest on the denial of this view because she observes that Forbes himself has ruled it out.)¹⁹ So, it appears that Forbes would not have to resort to predecessor essentialism here in order to have a defense against her reasoning if he would only accept precursor descent as a requirement for identity. Now why wouldn’t he? That brings us to (1).

What reasons might Forbes have for rejecting the requirement of precursor descent? In Forbes (2002), he rejects what he calls identities or non-identities that lack intrinsic grounding. He holds that, for anything to be acceptable as part of what is essential to identity in the origin of an item, it must be intrinsic to the item—or at least “identity-relevant” (2002: 320–321). Things he mentions as important in this regard include: first, that intrinsic features not involve dependence on something that is causally isolated from the individual, and, second, that there be no ungrounded non-identities, which he sees as tied to the requirement that indistinguishability of intrinsic nature across possible worlds suffices for identity.²⁰

¹⁷ In the ordinary case for humans (where parents are involved), the precursors involved would be the parents, so precursor descent would amount to the parental requirement. In cases of indirect biological engineering, the precursors involved would be cells that were biologically engineered to produce the zygote.

¹⁸ Robertson (1998, pp. 744–745). On p. 745, she writes of the argument she uses against Forbes, “... the argument requires the rejection of *strong origin essentialism*, the view that it is essential to an organism to come from the *very propagules* from which it actually arose ...”.

¹⁹ Robertson makes this observation on p. 746 and also observes that while Forbes rules out strong origin essentialism in Forbes (1986), he did hold that view in Forbes (1985).

²⁰ He later qualifies these “in a modest way” (2002: 320) as necessary to allow for predecessor essentialism.

Now, as to the first, it's clear that the precursors an organism descends from are anything but causally isolated from it—they are about as causally connected as you can get.²¹ As to the second, there are, of course, issues of clarity surrounding what counts as intrinsic, and Forbes himself remarks upon this at length. Indeed, a too restrictive account of the intrinsic would seem to put this second element of importance in conflict with the first. In any case, Forbes eventually opts for predecessor essentialism, and if position in order of appearance qualifies as intrinsic to an individual, then having descended from the precursors one actually has should certainly qualify. Indeed, the very centrality of biological process in the nature and identity of an organism over time should counter any attempt to eliminate it as part of the nature of the organism, intrinsic or otherwise. Just as Forbes acknowledges Robertson's point, as indeed he must, about the nature of organisms and the possibility of recycling and, at least implicitly, therefore, accepts how the biological process involved in recycling subtends the persistence of identity through change over time, so he must also accept that the very diachronic and temporally extended nature of the biological process that underlies identity for organisms over time forbids any synchronic conception of intrinsic nature from being permissible as a determinant of identity for organisms.²² And yet it indeed seems as if it is a mistaken synchronic view of intrinsic nature that is at the root of the problem here in Forbes' readiness to reject precursor descent out of hand. Perhaps this proceeds from an implicit assumption of parity, in this regard, of organisms with non-organisms, where process may not be so obviously implicated metaphysically. It would seem, then, that for Forbes the diachronic and temporally extended nature of process implicated metaphysically in the identity of organisms only starts from the zygote (in this particular range of cases); he does not see that it reaches back even before that, since organic, biological process is involved in the very formation of the zygote in the case we started from.

The ways in which biological process is involved in determining identity are multi-faceted. Failure to appreciate this actually produces a difficulty for predecessor essentialism itself, as Forbes proposes it. Forbes does, of course, see the necessity of dealing with biological process in one connection because it is at the root of the recycling issue. However, his strategy of employing predecessor essentialism as a solution to the recycling problem seems to indicate that he hasn't sufficiently reflected on the variety of ways in which any such process might operate. Insofar as predecessor essentialism makes the order of appearance of a

²¹ In the ordinary case these would be the actual gametes that produce the actual zygote that develops into the mature individual.

²² Indeed, without this essentially diachronic and temporally extended nature, there would be no reason to hold that there can be identity in the face of substantive material alteration over time, as is possible in the case of any developing organism. Moreover, the entity being talked about is not, after all, a mere temporal stage that exists on its own without any underlying process binding the stages together as part of its being.

zygote's material configuration essential to its identity without any qualification,²³ it neglects consideration of a possibility that exists for biological development.

Consider this. The posing of the recycling problem rested on the possibility that the process of biological development would allow for the later formation of another, different individual that was materially and formally identical to the original, since material making up the earlier individual could be cast off by it and taken up in the making of another individual. But it also seems possible that a biological process of development might eventuate at some point in the reconstitution of the original arrangement of the original material. In other words, a process of re-assimilation and reconfiguring might produce this result: a later temporal stage of the individual might be formally and materially identical to one of its own earlier temporal stages. But, of course, it would not be a different individual then (and this would be true, however many other identical reconfigurations there were in its organic development, even if they were between these two). So, if these two temporal stages must be stages of the same individual at different times, then it would be false to hold that temporally distinct formations of the same material configuration are necessarily different individuals. Difference in order of formation of the same material configuration does not imply difference in identity of individual. Thus, this stands as a counterexample to Forbes's presumption that, without qualification, the order of formation of the same material configuration determines the identity of the individual zygote and is the same in any possible world in which it exists. What makes this presumption false in the case in point is the biological process that connects the different formations involved as different temporal stages of the same individual. So it's not the order of formation that determines individual identity, but rather the process of formation. The same process assimilates different material at different times and makes it the same individual; so too might it re-assimilate the same material (even in the same arrangement) and make it again the same individual at a different time. If order of formation of a material configuration is ever important to identity, it can only be because the process of later formation is distinct in the right way from the process of earlier formation.

All of this brings home once again the fact that biological organisms have process inherent in their metaphysics. It is for that reason that biological descent is essential to their identity. Moreover, it must be emphasized how pervasive are the ramifications of this point. The formative aspect of biological processes extends not only from organisms back to zygotes and beyond that to gametes, but all the way back to the evolutionary development of individual species and therefore connects up with how they are related by descent.²⁴ One can therefore see essentiality of origin as bound up with this descent. That is not to say that there are no changes of

²³ He means it "in the sense of predecessor that means ... having the same matter configured in the same way" (2002: 328).

²⁴ If indeed species are to be taken to be natural kinds and to operate, in the Kripkean way, like names, then this descent, or some part of it, would be necessary to individual species.

any kind possible in the actual descent of an individual that would preserve its identity, but only that there are limits upon such changes.²⁵

5 Biological process and origin

As already explained, both Forbes and Robertson presume that no one would deny that a zygote that was materially and formally identical to Alzy, regardless of how it came to be, would have a claim to being Alzy, with one proviso. That proviso has to do with the recycling problem. In response to that problem, Forbes amends his original position to include predecessor essentialism (something Robertson finds unappealing). So, Forbes' final position still does not regard biological process as being important to the identity of the zygote. With the one proviso of order, matter and configuration alone determine identity. That matter and configuration occupy this lofty position rests entirely on the intuition that nothing else could be identity relevant.

Suppose one responds to the Alzy/Twin Alzy counterexample by saying that it rests on an intuition that may not be shared by others, the intuition, namely, that Twin Alzy is not Alzy. How has my account advanced the situation beyond where Forbes and Robertson leave it?

The first point to be made is that my account falsifies the presumption made by Forbes and explicitly stated by Robertson, that no one would deny that zygotes that are materially and formally identical but constituted in different ways have claim to being identically the same zygote. My account indicates not only that it can be denied but explains why.

The second point is that I present a case that supports the intuition. It is thus not merely an intuition in the other direction, but rather an intuition delivered by the consideration of a new possible world scenario. Since the scenario is new, it remains to be seen whether Forbes or Robertson or anyone else would say they have an intuition in the opposite direction, even after considering it.

Third, I present an explanation of the intuition. It indicates why the answer given is correct by identifying an element, namely, biological process, that seems crucial

²⁵ This last observation provides material for an answer to a question that Lowe (2007: 288) raises about Adam. That question was: would the case of an Adam—the first human being—raise a difficulty for parental or precursor descent? Lowe suggests that the parental requirement would either lead to an infinite regress or become problematic upon consideration of the case of an Adam—the first human being. For that reason among others, he rejects essential origins. But his concerns can be addressed. One can say, first, that there was in fact no Adam in the biblical sense; and, second, for any identifiable 'first human', ancestral origin would still play an essential role in identity. Even if the parents are not human, they are still the individual's parents. (This necessary line of descent would extend even to remote origins involving asexual reproduction and thus only a single progenitor.) Lowe puts great store in the purported difficulty of any such first human's being unique in this way. Shouldn't all humans be one way? But of course, that would only seem a requirement if one were presuming an account of individual identity to follow conceptual lines involving a priori necessity. Kripke's account, however, explicitly involves *a posteriori* necessity having to do with the nature of the relevant item and is therefore responsive to scientific discovery of distinctive features of evolutionary development, including those pertaining to change involving the origin of species.

to identity. This element has not been considered before in this debate as relating to the particular question of identity at issue here.

Fourth, the account is buttressed by the clear importance of biological process in the constitution of continued identity through change. Continued identity of organisms through change is something that Forbes does accept, as one must. This implicates the importance of biological process as constitutive of identity through change in the biological case. So, if one accepts the importance of biological process in determining identity after the biological entity is formed, how can one reject it as essential to the very formation of the entity, when other biological entities (gametes) unite to form a new individual? The gametes, after all, do not simply go out of existence; they combine to become the new individual.

The identity of biological process through material and structural change is what underwrites identity of organism. This is true because the organism intimately involves process. But organisms do not (in general) merely spring into existence without there being any biological process involved in their coming into being. Therefore, whatever biological processes are involved in their coming into being should be expected to be implicated in their very identity as individuals and what underwrites their identity, just as they are implicated in the identity of any biological precursors that produce those organisms. Just as we should rule out as identical to AI something related to a separate biological process that produces an “organic stage” that is materially and formally identical to an actual stage of AI, we should rule out as identical with AI any initial coming into being stage that is materially and formally identical to actual AI at that stage, so long as that former stage is part of, or the product of, different biological processes. Not to respect the importance of biological process here would be to deny the biological nature of the biological organism. The identity-determining process for the organism results from the coming together of other biological entities that themselves have their own identity-determining processes, as well as the coming together of their processes. In the case of the human AI, say, the other biological entities involved are the sperm and egg that produce him. Those gametes each have their own identity-determining processes that combine, as do their material composition, to produce the resulting biological entity and its own identity-determining biological process.

As has already been noted, the biological process account also has the advantage of avoiding predecessor, or order, essentialism for biological origins. This is particularly noteworthy because, not only does it thereby avoid something that seems unappealing on its own, but it also accords better with independently appealing requirements that Forbes lays out for an item’s essential properties, namely, that they be intrinsic and not causally isolated. Biological process can certainly be held to be intrinsic to biological entities and anything but causally isolated.²⁶

²⁶ See the discussion of Forbes on intrinsic features in the previous section. I wish to thank an anonymous reviewer for encouraging me to elaborate my argument here.

6 Back to Kripke

Now we can bring the discussion back to Kripke's seminal work itself. The biological process requirement we have been discussing is akin to what Kripke himself seems to be gesturing towards when he speaks, not about the *zygote*, but about the *sperm and egg* coming from the tissues of the parents that produce the individual, Queen Elizabeth II (Kripke 1980: 112–13). He says:

Let's suppose that the Queen really did come from these parents [her actual ones]. Not to go into too many complications here about what a parent is, let's suppose that the parents are the people whose body tissues are the sources of the biological sperm and egg. ... can we imagine a situation in which it would have happened that this very woman came out of Mr. and Mrs. Truman? [p. 112] ... How could a person originating from different parents, from a totally different sperm and egg, be *this very woman*? [p. 113]

The clear intent of this seems to be that that very sperm and egg are required for the identity of that person. The sperm and egg have to have come out of the original parents. Of course, Forbes thinks that the only requirement is that the individual person arise from the "same zygote" or the "same cell" resulting from the union of that sperm and egg, in the sense in which it's sufficient to be the same zygote or same cell if the same molecules in the same formal arrangement compose the item (subject to the eventual qualification connected with predecessor essentialism). But holding this to be sufficient for sameness of zygote or sameness of cell omits consideration of the fact that the actual causal, biological processes involved in the original case may be a requirement of identity. As we have seen, Forbes ultimately provides no good reason to deny this. Indeed, the only basis for this seems to be an unjustified assimilation of the biological to the non-biological and a lack of consideration of the important ramifications of the diachronic and temporally extended but identity-preserving nature of the biological process involved.

7 Biological development and non-biological singularities

Forbes's denial (and that of others) that parentage or process of formation is important to identity seems based on a fundamental misconception about what is relevant to the determination of the identity of biological organisms, especially at their point of origin. He appears to go wrong in his reasoning when he neglects the variety of ways in which biological process is crucial in those determinations of identity. The underlying reason for this seems to be his apparent inclination to give similar treatment to biological and non-biological entities at least at one critical stage of the biological process. He seems to focus on the particular material configuration of the *zygote* because he does not consider it necessary to treat that biological organism differently from a non-organic item like a table, at least at that formative stage. Clearly, however, biological process of development is important there as elsewhere. It can determine whether or not a given material arrangement

preserves identity. (As we have seen, if the same material arrangement is not process-connected it can be a different entity, as in the case of Alzy and Twin Alzy or in the case of recycling discussed by Forbes, while if it is so connected, as in the case of organic reconstitution of the same material arrangement, it can be the same entity.) This applies both in the case of the identity of zygotes and in the case of the identity of sperm and egg. Just as Alzy is not the same zygote as Twin Alzy, so too Alzy's sperm and egg are not the same sperm and egg as Twin Alzy's sperm and egg since they differ in the biological process of formation, even if they have exactly the same material and formal constitution. Since this process is something that can be investigated by science, the account that accommodates it will have an a posteriori component just as Kripke suggests. Its historical details will also encompass evolutionary development.

Forbes' recycling problem, however, is an issue that still needs to be addressed, at least as it pertains to recycling through *direct* biological engineering. But it is not the recycling itself that is the problem for identity (for we've seen that biological process of formation, where involved, can take care of it), or indeed biological engineering per se. Rather it is the presence of a non-biological singularity in the formation process of the resulting biological entity that is the problem. That is what distinguishes direct biological engineering of zygotes, say, from biological formation of them as well as from indirect biological engineering of them (where the singularity would occur in previous steps and the biological process it produced would be enough to distinguish the resultant zygote from any one directly engineered). Direct biological engineering corresponds to Forbes' case where scientists construct the zygote nucleotide by nucleotide, while indirect biological engineering corresponds to his case where scientists produce a half dozen or so cells that then produce the zygote biologically (Forbes 1986: 7–8).

But there is a much deeper general point to be made here. Reflection upon the nature of non-biological singularities makes it clear that they do not occur only in such cases of biological engineering as already described. For such a singularity would also occur in a more cosmic sense at the very dawn of the evolution of life processes from non-biological beginnings. Thus, when life first evolved on earth or elsewhere from non-biological origins, there was such a singularity somewhere along the line in the same way as there is for an instance of direct biological engineering. This makes it possible therefore to imagine a cosmic recycling scenario in which life evolves again in exactly the same way from exactly the same material and formal beginnings. Even if materially and formally identical individuals evolved, it would seem problematic to hold that the second evolution involved identically the same individuals as the first. Now, whether that would make a cosmic version of "non-biological singularity predecessor essentialism" an advisable option depends at least in part on whether or not there is an identity-relevant aspect to non-biological causal processes that one could identify as a counterpart to the biological ones we have been discussing. And this would also obviously make a difference to the matter of predecessor essentialism in the case of direct biological engineering. However, even if invoking predecessor essentialism were necessary at these points (and perhaps one could imagine a possible world in which even the non-biological causal processes were "recycled"), that would be quite different

from doing so at every point at which an organism formed from its biological progenitors.

8 Conclusion

It appears, then, that the line of thought we have been discussing (leading to Forbes' matter-configuration principle and Robertson's principle [Pb]) offers no good reason to hold that parental or precursor descent cannot be a necessary part of the identity of a person, or more generally, an organic, biological entity—at least in those cases in which it actually does occur. It also appears that the alternative view here defended is more in line with Kripke's original intent in *Naming and Necessity*. What seems to lead Forbes, Robertson and others astray is a false presumption of commonality between the organic and the inorganic in respect of the degree of importance of the matter and form of their original constitution, without any consideration at all given to the history and process of biological formation. In a sense, then, one can see this mistake as being due to a failure to take seriously Kripke's account as one involving a posteriori necessity. If one assumes that non-biological entities like tables and biological ones like organisms, must be alike in whatever is part of their essential origins, and that history of development or production cannot be a part of what is necessary to their origin, then one is likely to adopt a view involving something like the matter-configuration principle of origins as sufficient for the identity of organisms. But to do so would seem to be to give way to a priori presumptions without adequate reflection on the importance of an a posteriori investigation into the nature of organic processes that govern their formation and development. The significance of biological process in identity, and of such of its details as encompass evolutionary development, needs to be explored a posteriori. Absent such investigation, one might fall prey to implicit a priori presumption of similarity where there is actually difference waiting to be found.

It is interesting and telling that Kripke himself never refers to the zygote involved in the history of a human being. In talking about the necessary origin of Queen Elizabeth II he mentions only the sperm and egg from which she arose and the fact that they came from the tissues of individual people—her actual parents. In talking about the necessary origin of non-biological entities like tables, he mentions the material out of which they are made. There is a clear difference set up here between the biological and the non-biological, and perhaps that difference should be taken to suggest something significant.

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