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Plasticity, Numerical Identity, and Transitivity

In his aptly titled "I Am Not the Zygote I Came from because a Different Singleton Could Have Come from It," Chunghyoung Lee argues that, because zygotes are developmentally plastic, they cannot be numerically identical to the singletons into which they develop, whence it follows that "[e]very zygote is numerically distinct from any actual or possible infant, child, or adult (or any full-fledged human being)."[1] Lee then applies this finding to recent debates about abortion in order to undermine conceptionism, the thesis that persons come into existence at conception.

In this short paper, I respond to Lee. I argue, first, that, on the most popular theories of personal identity, zygotic plasticity does not undermine conceptionism, and I argue, second, that, even overlooking this first issue, Lee's plasticity argument is problematic. To that end, the paper is divided into five sections. In the first, I review Lee's argument. In the second, third, and fourth, I explain why zygotic plasticity does not undermine conceptionism for ensoulment theory, psychological continuity theory, or physiological continuity theory, respectively. In the fifth, I tease out a larger problem with Lee's plasticity argument.

I want to make one quick clarificatory point before I begin: although I defend conceptionism from Lee's plasticity argument, I do not take a stand here on whether conceptionism is the best, or even a plausible, position in the abortion debate, much less on the legal or ethical permissibility of abortion in general. My goal is at once more modest and more audacious: to push for the conclusion that transitivity fails when we are talking about numerical identity of non-numbers.

1 Zygotic Plasticity and Singletons

As Lee points out, one influential argument against conceptionism is based on the twinning thesis:

> TT At conception, twinning is still possible, meaning that it is still possible for a zygote to split into two distinct individuals.

The twinning argument is as follows: because of TT, there is no distinct individual at conception; if there is no distinct individual at conception, then no human is numerically identical to the zygote from which she develops; if no human is numerically identical to the zygote from which she develops, then no zygote is a human being; therefore, no zygote is a human being.[2]

However, as Lee also points out, this argument is subject to a fatal objection:

> Given a seemingly continuous series of stages existing at different times such as the series of stages from a zygote to the singleton it develops into, how can the mere possibility of branching such as twinning, division, and duplication show that the series belongs not to one object persisting through time but to two or more objects, one of which is replaced by the other(s)?[3]

According to Lee, the problem is that, precisely because the TT is merely hypothetical, a conceptionist can accommodate the TT with only a very minor modification: instead of insisting that all persons come into existence at conception, she might concede that twins do not come into existence at conception while nonetheless cleaving

[1] (Lee, 2022, p. 318).

[2] (Lee, 2022, pp. 297-298).

[3] (Lee, 2022, p. 298).

to the idea that all non-twins do so. That is, a conceptionist can argue that, at conception, there is a person *h*, and if, in the actual world, *h* develops into a single individual, then that single individual is numerically identical to *h*. If, in some nearby possible world, twinning occurs, then *h* is destroyed at the moment of twinning. This destruction gives rise to two distinct individuals, *i* and *j*, neither of whom is numerically identical to *h*. But, the existence of *i* and *j*, and the destruction of *h* in the world in which twinning occurs, do not in any way impugn *h*'s continued existence in the actual world. So, the twinning argument undermines the numerical identity of twins to the zygote from which they develop--but, the twinning argument does not undermine the numerical identity of individuals to the zygotes from which they develop in general.

Moreover, attempts to supplement the twinning argument are unpersuasive. For example, DeGrazia maintains that "[w]e come into existence some time between the sixteen-cell stage and the time at which differentiation characterizes all portions of the embryo and twinning becomes impossible," and one of the arguments he uses to justify this position is that "if a single-cell zygote is one of us, then two extraordinary implications follow: (1) Three-fourths of humanity is never born and (2) those who attribute full moral status to us from the first moment of our existence ought to grieve for all zygotes lost in spontaneous abortions."[4]

One problem with DeGrazia's argument is internal: claiming that moral status begins at the appearance of the primitive streak does not seem to avoid either of these "extraordinary implications" (i.e., the percentage of spontaneous abortions is lower but still substantial from the appearance of the primitive streak). A more substantial problem is that there does not seem to be anything more extraordinary about (1) than there is about the claim that three-fourths of successful conceptions are never brought to term, and the connection, in (2), between moral status and grieving in this context is, at best, tenuous.

Given the failure of arguments against conceptionism based on the TT, Lee proposes a new argument, one based, instead, on the zygotic plasticity thesis:

> ZPT At conception, a zygote exhibits plasticity, meaning that it is still possible for it to develop into distinct individuals.

At first blush, it might appear that the ZPT is weaker than the TT: after a plasticity event, there is only one distinct individual in a nearby possible world, whereas after a twinning event, there are two. This difference can be illustrated using simple graph drawings in which nodes represent modal branch points; lines represent individuals; and worlds are represented with colors:

On the left, we see a twinning event: a zygote reaches a branch point; in the actual world, it continues to develop into an embryo whereas, in a nearby possible world, the zygote is destroyed, and two new embryos, neither of which is numerically identical to the embryo in the actual world, develop. On the right, we see a plasticity event: a zygote reaches a branch point; in the actual world, it develops into one embryo, whereas in a nearby possible world, it develops into another embryo, and these two embryos are numerically distinct. We therefore might wonder how the ZPT could be leveraged into a stronger argument against conceptionism than the TT.

However, the ZPT is not a weaker form of TT; it is, in fact, fundamentally different. The point of the ZPT is not that the possible two embryos after a plasticity event are numerically distinct from one another in the way that the three possible embryos after a twinning event are; rather, the point of the ZPT is that the two possible embryos after a plasticity event are numerically distinct from each other *and therefore from the zygote that gave rise to them*. I shall explain this in a moment. But, the point for now is that the ZPT is precisely geared toward scuttling the fatal objection to the twinning argument: after a plasticity event, the original zygote ceases to exist *in all possible worlds* (whereas, after a twinning event, the original zygote ceases to exist *only in the world in which*

[4] (DeGrazia, 2005, 253).

twinning occurs). Thus, the ZPT implies that *no* individual, and in fact no embryo, is numerically identical to the zygote from which it develops, because numerical identity cannot transmit across a plasticity event. Let me explain.

A plasticity event is not a mere garden-variety change; it is an identity-determining change--a change such that, if there are two different ways in which a plasticity event can unfold, then the two possible individuals that can result are numerically distinct. The phenomenon of plasticity is familiar from everyday life, as when a block of wood or a lump of clay can be made into different objects. On account of this familiarity, plasticity cannot be rejected out of hand as metaphysically mysterious. So, without getting into the biology behind the ZPT, let us assume, what hopefully seems *prima facie* plausible anyway, that zygotes are plastic: that, at conception, the identity of the embryo into which a zygote develops is pathway-dependent--that, even if, in the actual world, zygote *z* develops into embryo *e1*, in some nearby possible world, *z* develops into a numerically distinct embryo *e2*. Given this assumption about the plasticity of zygotes, and given the transitivity of numerical identity, we may infer that neither *e1* nor *e2* is numerically identical to *z*. To see this, we can use proof by contradiction: if either *e1* or *e2* were numerically identical to *z*, then, from transitivity, *e1* would be numerically identical to *e2*, contradicting plasticity. From this it may be seen that, because all zygotes exhibit plasticity, no human is numerically identical to the zygote from which she develops, and we can run the anti-conceptionism argument again--only this time, as noted above, the fatal objection to the twinning argument is defanged because, even in the actual world, the embryo is numerically distinct from the zygote from which it develops: the conceptionist is unable to modify her position in the way she did in response to the twinning argument.[5] It looks like conceptionism has been terminated.[6]

2 Zygotic Plasticity and Ensoulment

According to ensoulment theory, personal identity tracks the soul. Historically, ensoulment theory has gone hand-in-hand with substance dualism, the thesis that there are, on the one side, physical substances, like the body, which are spatial and nonthinking, and, on the other side, mental substances, like the soul, which are non-spatial and thinking. How these two substances stay in parallel (to enable phenomena like the veridical perception of the external world) is contentious: Descartes famously thought that there is mutual influence by means of the pineal gland; Malebranche also famously eschewed interaction in favor of divinely-guided parallelism, a position Leibniz, perhaps more famously, modified into divinely pre-established harmony. However, these details are less important for us except inasmuch as they help to fill out the basic idea behind ensoulment theory, which, again, is that personal identity tracks the soul.

Lee argues that the primary rationale for conceptionism is that, at conception, a human being, one that "is numerically identical with the man it will develop into," comes into existence, a rationale that is severely compromised by the plasticity argument.[7] But this seems, at best, disingenuous. The vast majority of conceptionists are so on religious grounds and, more specifically, on the grounds that conception involves not only the earthly fusion of sperm and egg, but also the divine fusion of matter and soul. Thus, if we work up the account most frequently found grounding conceptionism into a philosophically rigorous theory, then we wind up with ensoulment theory. However, on an ensoulment theory of personal identity, zygotic plasticity is irrelevant: it entails exactly nothing about the numerical identity of the individual who has come into existence. What makes the zygote numerically identical with the adult it will develop into is not the developmental pathway it follows but rather the fact that the same soul is fused to both. That is, the zygote might develop into a different cluster of cells

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[5] An alternate way to see this: with the twinning argument, we have grounds for privileging one of the possible embryos as numerically identical to the zygote--namely, the one that exists in a world in which twinning does not occur. There are no similar grounds available with plasticity.

[6] As Lee points out, plasticity ceases within one to two weeks after conception (Lee, 2022, p. 322). This suggests that a conecptionist might try an alternative "minor modification": personhood begins, not at conception, but at the point at which plasticity ceases, within one to two weeks after conception (à la DeGrazia and the twinning point). But, opponents of conceptionism argue that this modification is in no way minor--that, in fact, it lets the cat out of the bag, so to speak--they argue that this temporal retreat puts the burden of proof on the conceptionist-now-plasticist to provide a probative defense of wherever they now want to take a stand.

[7] (Lee, 2022, p. 319).

in a different possible world in which it follows an alternate developmental pathway, but, provided that the soul that is connected to those cells is the same, the individual in that different world is numerically identical to the individual in the original one. Indeed, if zygotic plasticity is accepted as identity undermining for the embryo (I argue in section 5 of this paper that it should not be accepted as such, but if we ignore that), then zygotic plasticity might be taken to be merely another manifestation of the potential for a many-many relation between souls and bodies. In bygone times, people believed in zombies (0-1), in angels (1-0), in transmigration (1-many), in possession (many-1), and in much else besides; zygotic plasticity might be a modern manifestation of this sort of thing (1-many), but it need be nothing more and, as such, does not even constitute a novel challenge for the conceptionist.

This is not to say that we should adopt an ensoulment theory of personal identity. Substance dualism seems like a heavy philosophical burden in itself, to say nothing of the difficulties, hinted at above, associated with soul-body interaction. Moreover, there are objections we could raise to ensoulment theories in the context of the abortion debate. For example, we might wonder how we determine that ensoulment occurs at conception rather than at some other time.

But, the point for present purposes is simply that the ZPT misfires against ensoulment theories--zygotic plasticity in no way, shape, or form impugns personal identity if the latter tracks the soul--and so a conceptionist can sidestep the plasticity argument by appeal to an ensoulment theory of personal identity, which is especially problematic for Lee given that, as noted above, most conceptionists also happen to be ensoulment theorists.

3 Zygotic Plasticity and Psychological Continuity

According to psychological continuity theories, personal identity tracks psychological continuity. Psychological continuity theorists can be substance dualists. For example, Locke, widely regarded as the ur-psychological continuity theorist, seems to have thought that psychological properties are properties of the soul and, thus, that a single soul can contain two or more persons. But, psychological continuity theorists need not be substance dualists: they might maintain that psychological properties inhere in physical substances.

Psychological continuity theorists generally do not maintain that numerical identity tracks a specific cluster of mental properties, such that X's numerical identity fractures with the cessation of some cluster of beliefs, desires, preferences, or memories. Rather, psychological continuity theorists generally maintain that persons are processes, and personal identity breaks when, but only when, there is a discontinuity in the process: there is no saltatory conduction of identity.[8]

But the point for now is that psychological continuity theory, like ensoulment theory, does not have any obvious connection to zygotic plasticity. Embryos and zygotes do not seem to have any psychological properties at all. So, the identities of zygotes and embryos, and how these identities relate to plasticity, are totally irrelevant to personal identity on a psychological continuity theory.

Now, Lee might object at this point. In particular, Lee might point out that, if a psychological continuity theorist regards the ZPT as irrelevant to personal identity on the grounds I just suggested, then conceptionism is still off the table. Indeed, Lee might note that, if psychological continuity is true, then not only is it the case that no human, adult, or infant is numerically identical to the zygote from which it develops, but, more, no human, adult, or infant is ever born, because the emergence of psychological properties sufficiently complex to support psychological continuity does not take place until 10-14 months after birth or more. If psychological continuity is accepted, then it seems that adults emerge at some point around 1 year after birth. Thus, Lee might concede that the ZPT will not get anywhere against psychological continuity, and so he might concede that the ZPT does not undermine conceptionism if we accept a psychological continuity theory of personal identity--but, Lee might note that this is only because a psychological continuity theory of personal identity *already* undermines conceptionism (and much more besides).

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[8] This is an oversimplification; sleep seems to be a straightforward counterexample to this claim even though any psychological continuity theory worth its salt would not have a problem with such a prosaic juncture. But, the details of these views are unimportant for present purposes.

However, I think that this is too quick. The problem is that, as I pointed out above, my goal is not to assess conceptionism *per se*; my goal is to assess the extent to which Lee's plasticity argument undermines conceptionism on the three main theories of personal identity. So, the question is not whether conceptionism is plausible on a psychological continuity theory; the question is, rather, whether the conjunction of conceptionism and psychological continuity theory is undermined by Lee's plasticity argument--and I think that this question can only be answered in the negative. That is, there is nothing logically contradictory in the conjunction of conceptionism with psychological continuity theory; a psychological continuity theorist might argue that a zygote is special precisely because it has the potential to develop into an individual that, some day, can have a psychology like ours. And however im/plausible this conjunction might be in itself, it does not seem to be undermined in any way by Lee's plasticity argument.

4 Zygotic Plasticity and Physiological Continuity

Physiological continuity theories of personal identity, like psychological continuity theories of personal identity, hold that we are processes rather substances. But, unlike psychological continuity theories, physiological continuity theories focus on the development of the body rather than the mind.[9] That is, physiological continuity theorists argue that personal identity tracks the evolution of the body as it grows, develops, and changes through a continuous causal process.

It seems pretty clear that Lee's argument is aimed at physiological continuity theorists: of the leading theories, only a physiological continuity theory even approaches the thesis that zygotic plasticity has anything to do with identity. But, as in the previous section, the question I am asking now is not whether plasticity is identity undermining, but, rather, whether Lee's move from plasticity to the falsity of conceptionism goes through--and, thus, whether the conjunction of conceptionism and physiological continuity can be maintained in the face of the ZPT.

The problem is that conceptionists who adhere to a physiological continuity theory of personal identity can preserve the spirit of their position in the face of plasticity with only a minor modification. Let me explain. As noted in section 1, Lee objects to the twinning argument on the grounds that, in response to it,

> all that conceptionists need to concede is that twins (or multiples) do not begin to exist at fertilization (but right after the division of an embryo), though singletons do...This is a very minor revision of conceptualism. If this is all that the arguments from twinning show, they achieve little.[10]

However, conceptionists who adhere to physiological continuity theory can make a similar concession in response to the arguments from plasticity: instead of arguing that abortion is at least *prima facie* impermissible from conception on the grounds that a unique individual human life comes into existence at that point, a conceptionist can argue that abortion is at least *prima facie* impermissible from conception on the grounds that a unique individual human life can develop out of the living process that comes into existence at that point.[11] So, it seems that, even if Lee's plasticity arguments are accepted, even a physiological continuity theorist need not back away from conceptionism.[12]

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[9] There is room for some overlap here if the physiological continuity theorist focuses specifically on the brain and holds, in addition, that there is an identity relation between mental states and brain states.

[10] (Lee, 2022, p. 302).

[11] It is worth pointing out that this response does not entail or even suggest that there would be something unethical about the destruction of unfused gametes.

[12] I hasten to emphasize, as I did in the introduction to this paper, that my goal here is not to stake out a position in the abortion debate, much less to argue in favor of conceptionism.

5 The Problem with the Plasticity Argument

In the previous three sections, I argued against Lee's move from the ZPT to the falsity of conceptionism. In this section, I argue against Lee's move from the ZPT to the claim that an embryo is not numerically identical to the zygote from which it develops.

To begin, note that children seem to be psychologically plastic in the following sense:

> CPsPT Children are psychologically plastic, meaning that different developmental pathways, environments, and transformative experiences can result in a child developing into psychologically distinct individuals.

For example, suppose that there is a Jewish child in Nazi Germany who narrowly avoids being sent to Auschwitz. Suppose that she is adopted by a loving family in the US, and she grows up to become a bookstore owner, living a quiet but nonetheless happy and fulfilling life. And now suppose, in addition, that, in one of the possible worlds in which that child *is* sent to Auschwitz, she survives--and she goes on to join Mossad and to participate in various missions to hunt down Nazi murderers. These different life-experiences seem to be precisely the kinds of things that will undermine the plausibility of any claim to numerical identity between these two individuals, at least on a psychological continuity theory. But, then, an argument exactly analogous to the plasticity argument will entail the absurd conclusion that neither of these individuals is numerically identical to the child from which they developed: if these individuals are numerically identical to the child from which they developed, then transitivity entails that they are numerically identical to one another, contradicting the CPsPT. And if we accept, with the CPsPT, that children are generally psychologically plastic, then this argument generalizes to the even more absurd conclusion that no adult is numerically identical to the child from which they developed. Thus, it seems that we have only four options: (1) reject the plasticity argument; (2) reject the CPsPT; (3) reject the psychological continuity theory of personal identity; or (4) bite the bullet on this absurd conclusion. For those who are tempted by any option other than (1), let me advance to the next plasticity thesis.

Children seem to be not merely psychological plastic; they seem also to be physiologically plastic, in the following sense:

> CPhPT Children are physiologically plastic, meaning that different developmental pathways, environments, and consumption habits can result in a child developing into physiologically distinct individuals.

That is, once we remember that children's bodies are cycling through cells at a very fast rate; that these cells do not come from nowhere but, rather, are built up from the materials that the children are consuming (for a tangible example, consider the ways in which radioactive isotopes can be incorporated into tissues and tracked upon consumption); and that these materials, as well as how they are used inside children's bodies, can differ radically depending on where the children are, how the children are raised, and what the children are consuming--once we remember these things, the CPhPT becomes, I think, very difficult to deny. But, then, the plasticity argument, when conjoined with the CPhPT, will have the same absurd conclusion that it has when conjoined with the CPsPT: no adult is numerically identical to the child from which they developed. Once again, it seems that we have only four options: (1) reject the plasticity argument; (2) reject the CPhPT; (3) reject the physiological continuity theory of personal identity; or (4) bite the bullet on this absurd conclusion.

However, if we were tempted to reject psychological continuity theory in response to the psychological plasticity of children, we cannot now reject physiological continuity theory in response to the physiological continuity of children--not if we want to maintain Lee's argument for the conclusion that no human is numerically identical to the zygote from which she develops. So, suppose, instead, that we reject the CPsPT and the CPhPT--we take option (2) in response to both cases. This is a rejection of the psychological and physiological plasticity of

children. But, it leaves in place the ZPT and the plasticity argument. That is, it leaves in place zygotic plasticity and the argument which shows that plasticity is identity undermining.

However, what Lee fails to note about the plasticity argument is that it does not show merely that no adult, child, or infant is numerically identical to the zygote from which it develops; the argument shows, further, that a zygote is not numerically identical to itself through time--it shows that there are merely zygote time-slices. To see why, let us begin with a more conventional object that exhibits plasticity: a block of wood.

Suppose that, in possible world 1, a block of wood is carved into a horse, whereas in possible world 2, it is carved into a star. According to the plasticity argument, neither the horse nor the star is numerically identical to the block because, if either one is so, then, all else being equal, the other one is so, and by transitivity it follows that the horse is numerically identical to the star, which is absurd. But, now we can note that carving a horse or a star from a block of wood will take some time even for the most skilled carver around: these figures emerge from the block in a gradual process. Broadly speaking, we can say that we start with a block of wood; then there is some transitional object; and, finally, we have the carved figure. And now we can ask: is the transitional object numerically identical to the block of wood? If we answer in the affirmative, then the plasticity argument shows that the transitional horse is numerically identical to the transitional star, and this seems as absurd as saying that the horse is numerically identical to the star (to see why, note that it suggests, among other things, that either a horse or a star could emerge from the same object in an instant). And now we can apply this to zygotes.

Zygotes in the womb--zygotes that have not been cryogenically frozen--are in a continuous process of development. That is, unlike a block of wood, which might persist, unchanged, for a very long time before someone decides to make something out of it, a zygote in the womb is making something out of itself and, thus, is in a continuous transitional state. But, if transitional objects are not numerically identical to the objects from which they develop, then a zygote does not persist through time--a zygote exists merely as time-slices--and this seems to be absurd (indeed, if we accept either the CPsPT or the CPhPT and we apply this lesson to children, then children, too, exist merely as time-slices, which is even more absurd). As usual, there are only four options: (1) reject the plasticity argument; (2) reject the ZPT; (3) accept an ensoulment theory of personal identity and that ensoulment begins at conception; or (4) bite the bullet on this absurd conclusion.

What should we do?

It would take a lifetime to answer this question conclusively, but I do want to suggest what I take to be the most plausible way forward: it seems to me that we should reject the plasticity argument. But, of course, the plasticity argument relies merely on the transitivity of numerical identity--so, what I am suggesting is that, when we are considering non-numbers (and, more generally, non-abstract, temporally extended, changeable objects) transitivity, much like the identity of indiscernibles and its converse, the indiscernability of identicals, sometimes fails.

6 Conclusion

In this paper, I have responded to Lee's recent argument about how zygotic plasticity shows that no human is numerically identical to the zygote from which she develops. However, as shown in sections 2, 3, and 4 of this paper, the move from zygotic plasticity to the falsity of conceptualism is not as straightforward as Lee supposes. In section 2, I showed that ensoulment theorists need not be bothered by zygotic plasticity because, on their account, numerical identity tracks souls. In section 3, I showed that psychological continuity theorists need not be bothered by zygotic plasticity because any version of conceptionism maintained by a psychological continuity theorist would not need to appeal to the numerical identity of a zygote with a subsequent human's body. And in section 4, I showed that even a physiological continuity theorist, the most plausible target of Lee's argument, could maintain conceptionism with only a relatively minor modification.

In section 5, I turned specifically to Lee's plasticity argument. I argued that children are both psychologically and physiologically plastic, and I argued that this, when conjoined with Lee's plasticity argument, has absurd results. I argued, further, that, because zygotes are in a continuous state of development, zygotic plasticity, conjoined with Lee's plasticity argument, implies that zygotes are not temporally extended--another

absurd result. I suggested that the solution to these three conundrums is to reject transitivity for the identity of changeable objects.

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