

## PREGNANCY, PARTHOOD AND PROPER OVERLAP: A CRITIQUE OF KINGMA

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*Elselijn Kingma argues that, in cases of mammalian placental pregnancy, the foster (roughly, the post-implantation embryo/foetus) is part of the gravida (the pregnant organism). But she does not consider the possibility of proper overlap. I show that this generates a number of serious problems for her argument and trace the oversight to a quite general issue within the literature on biological individuality. Doing so provides an opportunity to pull apart and clarify the relations between some importantly distinct questions concerning organismality and organismic parthood, and to identify the implications that this has for those who want to draw on this literature when making metaphysical or mereological arguments.*

**Keywords:** pregnancy, parthood, mereology, organisms, biological individuality.

In a series of recent papers, Elselijn Kingma (2018, 2019, 2020a,b, 2021) explores a range of metaphysical questions concerning (mammalian, placental) pregnancy. The centrepiece of this project is her (2019) paper, in which she argues for the following claim:

(1) The foster is part of the gravida.<sup>1</sup> (Kingma 2019: 622)

More specifically, she argues that (1) is widely rejected, but without good reason, and that considerations drawn from scientifically informed accounts of organisms can be shown to support it. In doing so, she foregrounds questions concerning the mereology of pregnancy that have been largely neglected.

Why is the mereology of pregnancy important? For at least two reasons. In one direction, when applied to the special case of human pregnancy, it may have implications for a range of moral and legal debates concerning maternal

<sup>1</sup> The *gravida* is the pregnant organism. The *foster* is that with which the gravida is pregnant: roughly, the post-implantation embryo or foetus. (As Kingma (2019: 611) notes, if organisms count as being pregnant post-fertilization but pre-implantation, then zygotes and pre-implantation embryos can be fosters too.) Talk of the foster reflects the presumption of a singleton pregnancy. In a multiple pregnancy, there are multiple fosters.

obligations and rights, surrogacy, abortion, and so on—particularly where these debates have been shaped by implicit or explicit views about bodily ownership and autonomy.<sup>2</sup> In another direction, pregnancy provides a unique and often overlooked case study for one of the central debates within the philosophy of biology, namely the debate over biological individuality, which is concerned with questions about the existence, individuation, composition and boundaries of organisms (as well as other biological entities).<sup>3</sup>

This paper has two aims. The first is to critically evaluate Kingma's case for (1). I will argue not just that it falls short of the mark, but that the considerations she offers in fact lend some support to an alternative view, according to which foster and grávida properly overlap.<sup>4</sup> The second aim is to identify some important implications that this has for the literature on biological individuality and for those such as Kingma who want to draw on this literature when making metaphysical or mereological arguments.

In Section I, I introduce the standard mereological concept of proper overlap and explain how Kingma's discussion elides the possibility of proper overlap between foster and grávida. In Section II, I outline Kingma's argument and raise some general worries about her argumentative strategy. Doing so provides an opportunity to distinguish and clarify some importantly distinct questions—concerning organismality and organismic parthood—that are often run together. In Section III, in light of these complications, I evaluate the four criteria on which Kingma bases her case that the biological evidence speaks in favour of (1). I argue that three of these fail to support a verdict, while the fourth lends support to a verdict of proper overlap instead. In Section IV, I trace the problems identified in Kingma's argument to a quite general oversight in the literature on biological individuality on which she draws. Section V concludes.

## I. PARTHOOD, PROPER OVERLAP AND DISJOINTNESS

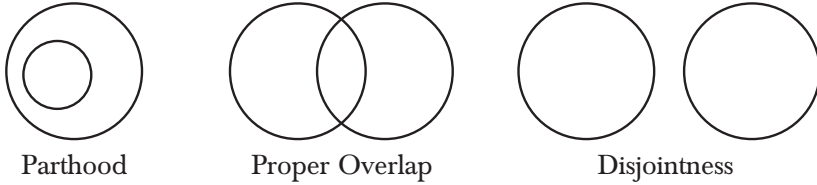
For any pair of distinct objects,  $x$  and  $y$ , the following four mereological possibilities—that is, possibilities concerning relations of parthood—are mutually exclusive and jointly exhaustive: Either  $x$  is part of  $y$ , or  $y$  is part of  $x$ , or  $x$  and  $y$  properly overlap (roughly: share some but not all of their parts), or  $x$  and  $y$  are disjoint (roughly: have no shared parts).<sup>5</sup> One natural, if rather abstract, way of picturing these possibilities is via the discs in Fig. 1:

<sup>2</sup> See, for example, Finn (2018) and Kingma & Finn (2020).

<sup>3</sup> See Grose (2020) and Kingma (2020a) for discussions of pregnancy and biological individuality.

<sup>4</sup> Finn (2021) likewise identifies proper overlap as a possibility not discussed in Kingma (2019), though she does not explore its significance for Kingma's argument or for the literature on biological individuality.

<sup>5</sup> Less roughly:  $x$  and  $y$  properly overlap iff something is part of both  $x$  and  $y$  and neither  $x$  nor  $y$  is part of the other.  $x$  and  $y$  are disjoint iff nothing is part of both  $x$  and  $y$ . In offering



**Figure 1.** Discs illustrating parthood, proper overlap and disjointness.

Concrete examples of parthood and disjointness come to mind readily: any composite object will provide for an example of the former; any two unconnected objects will provide for an example of the latter. Concrete examples of proper overlap are perhaps less obvious. But intuitive ones may include: conjoined twins; intersecting roads; a mountain and a nation with a border that cuts through it; and so on.<sup>6</sup> In such cases, there appear to be both parts that are shared by, and parts that are exclusive to, each object involved.

Given the distinctness of foster and gravida, then, the relevant mereological possibilities in a case of pregnancy are the following:

- (1) The foster is part of the gravida.
- (2) The gravida is part of the foster.
- (3) The foster and the gravida properly overlap.
- (4) The foster and the gravida are disjoint.

Kingma labels (1) *the parthood view*, and argues that it should be accepted. But she presents it as being in competition only with what she calls *the containment view*, according to which ‘the [foster] is not a part of the [gravida], but merely contained within or surrounded by it’ (Kingma 2019: 609). And it is clear that she understands *mere* containment to imply the absence of any direct mereological relationship. In other words, the containment view is (4). In presenting these as the only options, then, Kingma runs together  $\sim(1)$  and (4), equating rejection of (1) with acceptance of (4) and vice versa. But an argument for (1) requires more than an argument against (4). Arguments against (2) and (3) are also required. So, we need to ask not only whether the considerations

this definition of disjointness, I assume that parthood is reflexive. And in claiming that the first two possibilities are mutually exclusive, I assume that parthood is anti-symmetric. Nothing of substance turns on these assumptions. (But see Walters (2019) and Goodman (MS) for recent defences of anti-symmetry.)

<sup>6</sup> See Simons (1987: 12) for some of these examples, who notes that ‘[t]here appears to be a general tendency to draw conceptual boundaries, cast concepts of physical things and events in such a way that for most practical purposes proper overlapping is avoided.’ Interestingly, he also includes ‘the mother-foetus case’ as an (apparently uncontroversial) example of proper overlap—I return to this below.

offered by Kingma establish the existence of a direct mereological relationship here (i.e.  $\sim(4)$ ), but also whether they settle its nature (i.e. (1) vs (2) vs (3)).<sup>7</sup>

Now, Kingma does briefly mention (2), only to set it aside on the basis that it ‘seems bizarre’ (2019: 613, n. 12). But this already suggests that her considerations must fall short of settling the precise nature of the mereological relationship between foster and gravida. For (2) needs to be dismissed on such grounds only if the subsequent argument fails to rule it out.

Does it also fail to rule out (3)? Below, I will argue that the answer to this question is ‘yes’. Indeed, I will argue that, once (3) is on the table, we can see that it comes out with a clearer source of support than does (1).<sup>8</sup>

## II. KINGMA’S ARGUMENT

Kingma’s positive case for the parthood view draws on ‘four distinct criteria that frequently recur in work on the delineation of organisms’ (2019: 622)—that is, on criteria that can be found in the literature on biological individuality.<sup>9</sup> These four criteria, which may be satisfied or not with respect to some given organism  $x$ , are: *being in the internal/homeostatic environment of  $x$* ; *being metabolically and functionally integrated with  $x$* ; *being topologically/spatially continuous with  $x$* ; and *being immunologically tolerated by  $x$* .<sup>10</sup> And the argument is, in outline, straightforward: satisfying these criteria with respect to an organism makes a good case for being part of that organism; the biological facts show that the foster satisfies these criteria with respect to the gravida; therefore, the biological facts make a good case for the foster being part of the gravida.

Below, we will consider these criteria individually. Before that, I want to make some general points about the role that they play in Kingma’s argument and in the literature on which she is drawing. Doing so foregrounds issues that will prove relevant in what follows.

<sup>7</sup> A further potential complication is that any of (1)–(4) could in principle hold at one stage of pregnancy and not at another. Kingma assumes near the beginning of her paper that ‘in terms of their mereological relationship to the gravida, and thus for the purposes of this paper, they [i.e. all foster] can be treated alike’ (2019: 611). This assumption will turn out to be correct only if the differences in foster-gravida interaction at various stages of pregnancy prove to make no difference to the satisfaction of the criteria for parthood. And there are, of course, significant developments in foster-gravida interaction following the onset stages of pregnancy, immediately post-implantation (or even pre-implantation, if pregnancy can be said to have already begun). Below, I will focus exclusively on later stages, as Kingma herself largely does.

<sup>8</sup> For present purposes, I will largely follow Kingma in setting (2) aside. But if the thrust of this paper is correct, then (3) comes out with a clearer source of support than either (1) or (2).

<sup>9</sup> See Pradcu (2016a) for a useful overview.

<sup>10</sup> These criteria are discussed under the headings of ‘Homeostasis and physiological autonomy’, ‘Metabolic and functional integration’, ‘Topological continuity’, and ‘Immunological tolerance’, but are not all given precise, canonical characterizations. My phrasing of them is guided by what I take to be Kingma’s reasoning about their application, with one small wrinkle concerning the first—see Section III.4.

First, Kingma disavows any commitment to ‘the view that any one (or any combination) of [these criteria] provides either a necessary or sufficient condition’ for organismic parthood, suggesting only that satisfying all four would make ‘a very strong initial case’ for it (2019: 623).<sup>11</sup> She therefore treats the conditions as constituting defeasible criteria for organismic parthood, allowing for the possibility both of false positives (non-parts satisfying the criteria) and of false negatives (parts failing to satisfy the criteria). Even if something can be shown to meet the conditions with respect to a given organism, then the strength of the case for parthood will depend in part on whether we have any reason to suspect a false positive to be likely in the case at hand.

Second, the concepts involved in the first three criteria (the fourth is an exception—see below) are typically presented in the literature as being relevant, in the first instance, to the question of whether something is, or some things constitute, an organism. To the extent that they can thereby be taken to provide the materials for a test for something, then it is a test for *organismality*, or for *constituting an organism*, not for *organismic parthood*.<sup>12</sup> Of course, when applied to collections of two or more things, if those things pass the test, then this may be taken to indicate that they are/constitute an organism. And, if so, then each will be part of that organism. However, this does not imply any parthood relation *between* one of those things and the other(s).<sup>13</sup> To press these concepts into the service of delivering asymmetric verdicts of this sort, then, is to go beyond what can be properly said to be found in this literature. As we shall see, the differences here turn out to put a fine point on some of our questions concerning whether or not Kingma’s criteria are fit for purpose.<sup>14</sup>

<sup>11</sup> This is Kingma’s way of accommodating the multiplicity of non-equivalent and competing accounts of organismality or biological individuality that are currently taken seriously. See, e.g., Clarke (2010), DiFrisco (2019) and Pradeu (2016a, 2016b).

<sup>12</sup> We should distinguish between a test for *organismality/being an organism* (a property only of individuals) and a test for *constituting an organism* (a property of pluralities). Presumably, an individual should pass an adequate test of the first sort if and only if it has some exhaustive parts that collectively pass an adequate test of the second sort. Nevertheless, they are importantly distinct. For the purposes of the discussion below, though, I will use ‘organismality’ to speak ambiguously of both properties.

<sup>13</sup> Another aspect of the difference indicated here is that in the one case, the question concerns a *given* organism and some things’ relation to it, while in the other, it concerns whether some things are/constitute any organism at all. That is, one takes a given organism and asks about its mereological extent; the other takes a putative mereological extent and asks whether it corresponds to an organism.

<sup>14</sup> That said, the two fundamental questions at this level of generality—concerning the nature of organismality (“What is it to be an organism?”) and the nature of organismic parthood (“What makes something part of a given organism?”)—are rarely cleanly separated within the literature on biological individuality. And neither is strictly equivalent to the question concerning organismic constitution on which many discussions focus (“What makes some things constitute an organism?”). While intimately related, exactly how and how tightly answers to these questions may constrain one another will depend both on the details of the answers and on one’s general metaphysical assumptions. For example, one who accepts *compositionalism*, as characterized by Madden (2015), will view them as particularly intimately related, taking questions of the former sort to more or

One might suspect that this gap between organismality and organismic parthood can be easily bridged, at least in the present case. For one might think that if, at some stage of pregnancy, the foster and the gravida (or rather the non-foster parts of the gravida) collectively satisfy some such criteria for organismality, and so are taken to constitute an organism, then that organism must in fact be the gravida itself, in which case the foster is part of the gravida after all.<sup>15</sup> But things are not so straightforward.

First, as Kingma recognizes, it is not a given that a complex organism cannot be part of another organism (2019: 616–20, 632–3). Indeed, granted the very plausible assumption that fosters are (at least at later stages of pregnancy) organisms, her view implies that this is false. This complicating possibility will arise again below.

Second, and perhaps more importantly, there is a general and well-founded scepticism in the literature about whether these first three criteria provide plausible tests for organismality at all. This goes beyond their being ‘inevitably tendentious’, in virtue of this being ‘an ongoing area of research’, as Kingma acknowledges (2019: 622). It is rather that, at least in the absence of a detailed characterization of any particular *form* of homeostasis, integration or continuity that is plausibly specific to organisms, criteria invoking these concepts are likely to be satisfied by plenty of other entities and pluralities in the biological world.<sup>16</sup>

Indeed, in the very paper from which Kingma suggests she is drawing these first three criteria (2019: 622, n. 27), the authors point out that ‘these traits (i.e., ‘autonomy and homeostasis’, ‘functional integration’, and ‘continuity’) may describe levels in the hierarchy of life above and below that of the organism’, and so ‘are insufficient to answer’ questions of ‘part *versus* organism *versus* group’ (Pepper and Herron 2008: 623).<sup>17</sup> But if groups of organisms can exhibit these features, then showing, at any given stage, that the foster and (the non-foster parts of) the gravida collectively exhibit them will fail to suggest that they constitute an organism rather than something at a higher level.

This second complication presents a serious problem for Kingma’s argument as it stands. It is, of course, true that she provides us with some of the details of foster-gravida homeostasis, integration, and continuity. And so, in

less reduce to questions of the latter sort. It is an interesting question to what extent a commitment of this sort may have shaped contemporary discussions in the philosophy of biology—but it is one that I will not attempt to address here.

<sup>15</sup> There are hints that Kingma might sympathize with this line of thought. See, for example, the parenthetical remark in Kingma (2019: 610, n. 3).

<sup>16</sup> One might well suppose that we are looking for something more specific still. For the most tractable questions here are surely not ‘What is it to be an organism?’ and ‘What makes something part of an organism?’ (see footnote 14), but rather questions of the form ‘What is it to be an organism of kind K?’ and ‘What makes something part of an organism of kind K?’ Recognising continuity within the biological world and its history suggests that answers to the former questions ought not to be implausibly disjunctive—but that does not mean that they should be considered prior.

<sup>17</sup> See Clarke (2010: 316–7, 2021: 114–5) for relevant discussion.

principle, one can envision there being refinements of the three criteria, invoking more determinate (and plausibly organism-characteristic) forms of these phenomena, with the details provided then making a reasonable case for taking the foster and (the non-foster parts of) the grávida to satisfy the refined criteria. But then, in principle, one can equally well envision these details failing to make such a case.

Nevertheless, I will set this issue aside in what follows. For, given its unsettled nature, it is worth asking whether there are other problems with Kingma's argument, ones which could still find purchase should it be resolved in her favour. In considering this question, we are forced, for the sake of concreteness, to treat the various criteria for organismic parthood as if the broad concepts they employ *do* provide reasonable (albeit defeasible) criteria for organismality. And so, one might worry that any problems identified could end up being resolved by the details of the hypothesized, but as-yet-unspecified, refinements. However, this concern should not be given too much weight. For while, in advance, there may be no saying for certain, the most pressing problems raised below for the criteria in question largely turn on structural factors that we can expect to remain in place.<sup>18</sup>

### III. EVALUATING THE CRITERIA

Let us now turn to the four criteria invoked by Kingma, taking them in reverse order.

#### *III.1 Being immunologically tolerated by*

The criterion invoking immunological tolerance is primarily drawn from the work of Thomas Pradeu (2010, 2012, 2013, 2016b). He writes:

[T]he immune system, with its surveillance activity, defines what is accepted or rejected by the organism. A criterion of immunogenicity thus constitutes a *criterion of inclusion*: the distinction between entities that are interconnected and form a whole as constituents of the organism and those that are rejected is carried out by the immune system. In other words, immunology allows for an understanding of the living thing's spatial boundaries, and by extension determines which entities constitute its components. [...]

[M]y criterion demands both *presence* and *inclusion* (the absence of rejection): an entity is part of the organism only if it undergoes strong biochemical reactions with the rest of the organism (interconnection, presence) and constant systemic immune interactions of

<sup>18</sup> Specifically, they turn on the general issues raised above: on the differences between criteria for organismality and criteria for organismic parthood; and on Kingma's decision to deal with the variety of non-equivalent criteria by treating them as (individually and collectively) defeasible. But see footnote 28 for more on this worry.

an ongoing average intensity with the immune receptors (inclusion). (Pradeu 2012: 240, 246)

While Pradeu's metaphysical ambitions for immunology may outstrip Kingma's, it is clear that, in this case, her use of the criterion does in fact line up with its use in the literature on which she is drawing. Moreover, Kingma's verdict concerning pregnancy—that the foster counts as being immunologically tolerated by the gravida, and so by this criterion counts as part of the gravida—mirrors Pradeu's own.<sup>19</sup> They are, however, mistaken to believe that this is the verdict the criterion delivers.

Pradeu's account of immunological tolerance by a multicellular organism centres on immune interactions between that organism's immune receptors and token antigenic patterns or ligands. It is therefore given at a level well below that of any larger macro-entity, such as a foster, to which a given ligand-expressing component might be taken to ultimately belong.<sup>20</sup> But this means that we can assess the many ligand-expressing components of a given macro-entity *individually*, and determine for each one whether it does or does not count as being immunologically tolerated. And of course, at most if not all stages of pregnancy, there will be cells of the foster with which the gravida's immune system cannot be counted as interacting in the required way, as the gravida's immune system fails to pervade the foster in anything like the way in which it pervades the gravida. But then it follows that, according to the criterion, these parts of the foster are not parts of the gravida. And, because parthood is transitive, this in turn implies that the foster is not part of the gravida after all.

This does not mean that it will always be wrong to say that the foster is immunologically tolerated by the gravida. No doubt there will be a good sense of 'immunologically tolerated' according to which this is so. (This is why Kingma's and Pradeu's verdicts appear plausible.) The point is simply that this sense must be distinct from the sense that the phrase has when it features in the supposed criterion for organismic parthood. For it must permit an entity to count as being immunologically tolerated by an organism even if some part of that entity, and so the entity itself, is not part of that organism.

What are these different senses of 'immunologically tolerated'? Plausibly: In the sense according to which the foster is immunologically tolerated by the

<sup>19</sup> I attribute this verdict to Pradeu on the basis that he repeatedly asserts that the foetus is tolerated by the mother (2012: 46, 104, 111–6, 125, 207), in a context in which he defends an account of organisms according to which such toleration implies parthood (2012: 186, 243–8, 253–4). Perhaps he would in fact reject the verdict, either in light of the points to follow or because there are other complicating factors involved in pregnancy. My point is just that this would run counter to a clear implication of some of the claims he makes in presenting his view.

<sup>20</sup> Pradeu is not entirely explicit about what the immediate objects of immunological toleration are to be. Above, I assume that it is not the ligands themselves (i.e., not the molecules instantiating antigenic patterns), but rather the basic ligand-expressing entities (i.e., the cells expressing the molecules). But nothing turns on this point.



gravida, we extend the notion to the macro-organismic level by saying: If *any* of  $x$ 's cells are immunologically tolerated (and none of  $x$ 's cells are rejected) by  $y$ , then  $x$  counts as being immunologically tolerated by  $y$ ; while to deliver a sense suitable for a potential criterion for organismic parthood that can be applied to macro-entities, we must restrict ourselves to doing so by saying: If *all* of  $x$ 's cells are immunologically tolerated by  $y$ , then  $x$  counts as being immunologically tolerated by  $y$ . And the reason why only the latter is suitable as a criterion for organismic parthood is then clear: the former would imply that, in any case in which a cell of  $x$ 's is immunologically tolerated by  $y$  while a cell of  $y$ 's is immunologically tolerated by  $x$ ,  $x$  and  $y$  are mutual parts.

Note that none of this involves denying that there are suitable interactions between immune receptors belonging to the gravida's immune system and parts of the foster, or denying that the foster and gravida thereby overlap. And while it is an interesting question to what extent reflection on the point above may force refinements or revisions to Pradeu's view, we need not provide a full assessment of his criterion's prospects to see that it cannot play the desired role in Kingma's argument.<sup>21</sup> For the criterion points to proper overlap, and not to parthood.<sup>22</sup>

### III.2 *Being topologically/spatially continuous with*

Kingma uses 'topological continuity' and 'spatial continuity' interchangeably. So let us begin by noting that, strictly speaking, the criterion here cannot be one of spatial continuity. For  $x$  to be spatially continuous with  $y$  is, presumably, for the spatial regions occupied by  $x$  and  $y$  to be connected or to overlap. To know if  $x$  and  $y$  are spatially continuous, then, one would need to know the spatial regions occupied by both. And to know this would require knowing the physical/mereological extents of  $x$  and  $y$ . But the physical/mereological extents of the gravida and foster are precisely what the criterion is intended to help us decide.<sup>23</sup>

The criterion that seems to be in play here is rather one of *anatomical* continuity or connectedness: of there being a series of anatomical connections

<sup>21</sup> For further discussion of how Pradeu's view might need to be revised, see Geddes (MS).

<sup>22</sup> The claim that it points to proper overlap (rather than disjointness) requires not only that (i) at least some cells that are parts of the foster do not count as interacting with the gravida's immune system—as noted above—but also that (ii) at least some of the cells with which the gravida's immune system interacts are (still) parts of the foster, and not simply of embryonal/fetal origin. The discussion above has been assuming (ii), in line with Kingma and Pradeu.

<sup>23</sup> Note that this need not pose a problem for the role that spatial continuity (contiguity, or boundedness) appears to play in the literature (see Clarke (2010: 315), and references therein). For this role has been to help settle whether collections of entities are or constitute organisms in contexts in which the mereological/physical extents of the elements of those collections are not themselves in dispute.

linking the things in question.<sup>24</sup> And, if so, it is clear that Kingma's claim is correct: the foster does satisfy this condition with respect to the grávida. However, there are two problems for the use to which the criterion is put: a problem of *form* and a problem of *defeasibility*.

To begin bringing out the problem of form, note that anatomical continuity *per se* cannot straightforwardly provide even a defeasible criterion for organismic parthood. For one thing, it is symmetrical: If  $x$  is anatomically continuous with  $y$ , then  $y$  is anatomically continuous with  $x$ . For another, many anatomically continuous things are manifestly disjoint: the distinct organs of a complex organism, for example. If anatomical continuity in general is going to be taken to indicate a mereological relation, then this is at best via the assumption that the anatomical continuity of  $x$  and  $y$  provides a criterion for both  $x$  and  $y$  being parts of *some* organism: for organismic *co*-parthood or underlap. But, as noted in Section II, we have not ruled out the possibility of one complex organism being part of another. And so the claim that the grávida and foster are both parts of some organism is consistent with each of (1)–(4), even granted that the grávida is an organism.<sup>25</sup> What is needed, then, is some special reason for thinking that anatomical continuity *with a grávida* constitutes a criterion for parthood, despite anatomical continuity failing to do so in full generality. But it is not clear what this could be.<sup>26</sup>

To see the problem of defeasibility, recall that for any criterion to support (1), we require an absence of reasons to suspect that it might be generating a false positive for the foster being part of the grávida. However, it is surely reasonable to assume that, were proper overlap to occur within or between organisms, the overlapping entities would count as being anatomically connected. But if so, it follows that any criterion based on anatomical continuity will simply be blind to the difference between proper overlap and parthood: it will be satisfied in both cases equally. What this means is that any such criterion, whatever its merits more generally, will always, *ex hypothesi*, generate false positives for parthood in cases of proper overlap. So we cannot take the satisfaction of a criterion of this sort to provide us with a reason for accepting (1) over (3) at any

<sup>24</sup> The evidence Kingma provides for the claim that the foster satisfies it with respect to the grávida is that 'the placenta and umbilical cord both grow directly out of the foster's abdomen and into/out of the maternal uterine tissue—there isn't even a separating membrane' (2019: 628). Note that 'topology' has both an anatomical and a strictly spatial/mathematical sense. It is possible that the inclination to speak in terms of 'spatial continuity' results from a conflation of these senses.

<sup>25</sup> A criterion for organismic *co*-parthood is not equivalent to a criterion for composing or constituting an organism. And it should not be assumed that a given criterion for organismic *co*-parthood will straightforwardly generate an equally adequate criterion for composing an organism, via an appeal to maximal collections of organismic *co*-parts. For to assume that a collection constitutes an organism iff it is a maximal collection of organismic *co*-parts is just to assume that no complex organism can be part of another.

<sup>26</sup> If because the grávida is an organism, then a problem of symmetry is likely to remain. For, as noted above, the foster is very plausibly an organism.

stage of pregnancy. Unless (3) can be ruled out on other grounds, then, this criterion cannot support the parthood view.<sup>27</sup>

I will address the question of whether proper overlap can be ruled out in advance in Section IV. Before that, let us consider the final two criteria. We can be relatively brief, as the problems they face echo those faced by the criterion just considered.

### *III.3 Being metabolically and functionally integrated with*

Kingma describes a variety of the ways in which the foster and the gravida are metabolically and functionally integrated (2019: 626–8). And so we should grant that the foster meets this criterion with respect to the gravida. However, both of the problems that arose for the previous criterion arise again here.

First, the problem of form: the criterion is symmetrical, and satisfied by manifestly disjoint entities, and so can only feature straightforwardly in a criterion for organismic co-parthood. But, once again, such a verdict is compatible with each of (1)–(4). And it is not clear why metabolic or functional integration *with a gravida* should indicate parthood as a special case.<sup>28</sup>

Second, the problem of defeasibility: proper overlap within or between organisms would very plausibly involve the overlapping entities enjoying some degree of functional and metabolic integration. And so we should expect any criterion of this sort to generate false positives for parthood in cases of proper overlap, and to be incapable of deciding between these possibilities. Again, then, we require proper overlap to be ruled out independently in order to take the satisfaction of this criterion to support the parthood view.

### *III.4 Being in the internal/homeostatic environment of*

Kingma characterizes the distinction between an organism's internal and external environment in terms of that which the organism 'actively maintain[s]

<sup>27</sup> In fact, it cannot discriminate between parthood, proper overlap, and chains of proper overlap. It therefore cannot, in and of itself, decide between (1), (3) and (4) at many stages of pregnancy. If, for example, the structures of the umbilical cord and/or placenta properly overlap both the foster and the gravida, while the foster and gravida do not themselves overlap, then the foster and gravida are anatomically continuous and yet (4) is true. Nothing Kingma offers rules out this kind of possibility.

<sup>28</sup> One aspect of the foster-gravida relationship that Kingma notes in discussing both these criteria and the next is the asymmetric dependence of the foster on the gravida (2019: 626, 624). It seems reasonable to wonder whether this might, perhaps via a refinement of the criteria of the sort discussed in Section II above, contribute to a resolution of the problem of form. But it is not clear why the dependence of *x*'s functioning on *y*'s should be taken to indicate that *x*'s functioning is in any sense an aspect of *y*'s functioning. And, more importantly, this would do nothing to resolve the problem of defeasibility. (See DiFrisco & Mossio (2021: 193–4) for a brief discussion of the asymmetric dependence of foster on gravida that resists the idea that it implicates parthood.)

in a state of relative homeostasis', where 'temperature, acidity, osmotic pressure, and so on' are kept 'within a narrow range of parameters' (2019: 623). And the foster itself, she suggests, counts as being 'regulated by, and within the context of, the rest of the gravida' in just this way (2019: 624).<sup>29</sup>

Now, one might think that the problem of form should not arise in this case. For *being in the internal/homeostatic environment of* is not a symmetrical relation. Nor is it one that obviously holds between disjoint entities. But this is just an artefact of Kingma's choice to formulate the criterion in terms of the relation *being in the homeostatic environment of* rather than *being in a homeostatic environment with* (or simply *being in homeostasis with*). Formulated in the latter way, it could be granted that the foster meets the criterion with respect to the gravida, but a problem of form parallel to those above would arise. Formulated in the former way, the problem is simply transposed. For, in that case, there will inevitably be concerns about why it should be granted that the foster meets the criterion with respect to the gravida at all, rather than with respect to some larger organism with both as parts; and about why the gravida's internal/homeostatic environment should be thought both to extend to everything it is in suitable homeostasis with and to entail parthood, given that in one respect or the other the foster's must not.<sup>30</sup>

Moreover, the problem of defeasibility—the potential for a false positive—remains. Employing the latter formulation, this should now be obvious, as any case of sustained proper overlap within the biological world would surely involve the overlapping entities being in homeostasis. Employing the former formulation, the issue is less stark, for we would not expect just any instance of proper overlap between or within organisms to involve one of the overlapping entities counting as being maintained or regulated by the other. But recall that pregnancy is a case of containment. So, the relevant question is whether we would expect a case of proper overlap between one entity and another it contains to involve some degree of homeostatic regulation of the latter by the former. And indeed, this does seem to be a reasonable expectation. But if so, then this criterion will be incapable of distinguishing between proper overlap

<sup>29</sup> Kingma suggests that the foster should count as being within the gravida's internal environment not only 'on homeostatic grounds' (2019: 624) but also 'on spatial grounds' due to being spatially within the '(topologically) doughnut shaped unit that is lined by the epidermis [...] and the surface of the gastro-intestinal tract' (2019: 623)—the (other) elements of which uncontroversially count as being homeostatically regulated by the gravida and as constituting (at least in part) its internal environment. But these are not distinct grounds. For she characterizes the reach of an organism's internal environment exclusively in terms of what it maintains in homeostasis. And so, unless something within the doughnut meets the criterion directly, by *being* homeostatically regulated by the gravida (i.e. 'on homeostatic grounds'), then surely it should count as a hole in the gravida's (otherwise) doughnut-shaped region of regulation, and not part of the organism's internal/homeostatic environment after all.

<sup>30</sup> The suspicion that the asymmetric dependence of the foster on the gravida might help here is again reasonable. But see, *mutatis mutandis*, footnote 28.

and parthood in cases of containment, and so incapable of deciding between (1) and (3).

#### IV. PROPER OVERLAP IN THE PHILOSOPHY OF BIOLOGY

Are we in a position to rule out proper overlap in advance, or on independent grounds? I think the answer to this question is ‘no’.

While a lot could be said about this issue, it will suffice at present to point out three things. First, that we do not have to look too far afield to find relevant *prima facie* cases of proper overlap in the biological world: namely, cases of conjoined twinning.<sup>31</sup> Second, that the identification and consideration of such cases is almost entirely absent from the literature on biological individuality, despite its tendency to revolve around difficult (and sometimes pathological) phenomena. And third, that, in general, the conceptual and epistemic possibility of proper overlap is simply not taken into account with respect to any of the many cases that do come in for consideration in this literature.<sup>32</sup>

The first point, while in no way deciding the issue, suggests that the possibility of proper overlap is only to be ruled out on the basis of empirically informed theory and argument. But the relevant tranche of theory is surely just that comprising accounts of organismality and organismic parthood, on which Kingma was drawing. And the second and third points suggest that, even if we set aside the niceties of Sections II and III.2–III.4, it would be premature to take this literature, in its present state, to be capable of pronouncing with any authority on the impossibility of proper overlap. It also should come as no surprise, and mean little, if any of the various criteria *are* typically formulated, interpreted or applied in a way that appears to rule out this possibility. For these formulations, interpretations and applications are themselves largely subject to the myopia just noted.<sup>33</sup>

<sup>31</sup> Indeed, we don’t have to look much further to find *prima facie* cases of proper overlap with asymmetric dependence (consider parasitic twinning) or even with containment (consider, on at least one on theory of its causes, foetus in foetu). For the potential significance of these cases, over and above that of conjoined twinning *per se*, see, again, footnote 28.

<sup>32</sup> Where the possibility does arise in connection to concreta, it tends to concern not organisms but, for example, species (Haber 2016: 310) or token life-cycles (Godfrey-Smith 2016: 92)—and is viewed with some suspicion even there. Concerning organisms, it is used only to express a consequence of a certain sort of pluralism: overlap between the competitors for being a seemingly given organism, not between seemingly distinct organisms (Wilson 1999: 47, 68). Note that Griesemer’s (2000: s359) notion of ‘material overlap’ is *not* an example: In his sense, there is material overlap between *x* and *y* iff something that is part of *x* was part of *y* (or vice versa). (Nor, it is perhaps worth noting, is Kingma’s claim in passing that ‘their [the grvida’s and foster’s] genomes partially overlap’ (2019: 627), which merely asserts a partial sameness of genetic structure.)

<sup>33</sup> Boyle (2020) offers an interesting exception. Using arguments that are roughly akin to Kingma’s, she draws on a similar range of accounts of organisms to motivate the view that many cases of conjoined twinning involve only one organism, and she argues explicitly against a

It would be a mistake to make much of the fact that conjoined twinning is pathological while pregnancy is not, for—it is time to acknowledge—pregnancy itself is, if not a *prima facie* case of proper overlap, at least a *prima facie* plausible candidate for being a case of proper overlap.<sup>34</sup> And it would be a mistake to object to this, in turn, that pregnancy would offer the only non-pathological case of proper overlap in mammalian organisms, for pregnancy is obviously a unique phenomenon in a number of respects.

Finally, all of the above aside, Section III.1 showed that at least one account of organismic parthood—perhaps the only direct account of organismic parthood (rather than of organismality) present in this literature—not only predicts the possibility of cases of proper overlap but, I argued, should be taken to offer this verdict of pregnancy. And so there is surely no possibility of establishing an opposing verdict until this account can be justifiably rejected.

In sum: we have no good grounds, at present, to rule out the possibility of proper overlap. And one thing that all of this makes clear is that the epistemic caution Kingma showed in treating her various criteria as defeasible was exactly the right attitude to take. But as we have seen, given that defeasibility, her argument fails.

## V. CONCLUSION

Kingma raises an interesting and important question concerning the mereological relationship between the gravida and foster. It is of intrinsic interest, of potential moral and legal significance, and of special relevance for some central questions in the philosophy of biology.

In this paper, I have attempted to reveal the ways in which Kingma's argument in favour of the parthood view—the view that the foster is part of the gravida—falls short of the mark. All of these trace in one way or another to the possibility of proper overlap and to gaps between questions or criteria concerning organismality/organismic constitution, on the one hand, and organismic parthood, on the other.

I stop short of endorsing the conclusion that the foster and gravida properly overlap. While my sympathies and expectations are no doubt clear, the central lesson of the foregoing is surely that it would be premature to issue any definitive verdict here. We must, for the moment, suspend judgment.

verdict of proper overlap in these cases. I cannot offer a detailed consideration of her discussion here. I simply note that her arguments also strike me as eliding differences between organismic constitution and organismic parthood, and as taking the biological individuality literature to be capable of issuing verdicts that, to my mind, it currently cannot offer.

<sup>34</sup> Recall, from footnote 6, that pregnancy itself has been taken by some to be an obvious and uncontroversial example of non-pathological proper overlap (Simons 1987: 12).

I do not doubt that Kingma is right to look to the philosophy of biology in order to answer her question. It is just a mistake to draw uncritically on the various criteria to be found in this literature, at least in its present state. For the philosophy of biology itself, in order to take full advantage of its empirical sophistication, needs to be more metaphysically sophisticated: to take all mereological possibilities into account from the outset; to distinguish clearly and consistently between what are distinct questions; to apply and evaluate any proposals offered with the level of conceptual rigour they demand; and to issue novel verdicts with whatever cautiousness is rendered appropriate by the limits of its purview to date.<sup>35</sup>

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