**NINE MONTHS**

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**ABSTRACT**

When did we begin to exist? Barry Smith & Berit Brogaard (2003) argue that a new human organism comes into existence neither earlier nor later than the moment of gastrulation: 16 days after conception. Several critics have responded that the onset of the organism must happen *earlier*; closer to conception. This paper makes a radically different claim: if we accept Smith & Brogaard’s ontological commitments, then human organisms start, on average, roughly nine months after conception. The main point of contention is whether the fetus is or is not part of the maternal organism. Smith & Brogaard argue that it is not; I demonstrate that it is. This claim in combination with Smith & Brogaard’s own criteria commits to the view that human organisms begin, precisely, at birth.

**KEYWORDS**

Ontology, Embryo, Fetus, Substance, Foster, Fetal Development, Metaphysics.

**1. INTRODUCTION**

When did we begin to exist? In “sixteen days”, Barry Smith & Berit Brogaard (2003) (henceforth: S&B) employ a combination of ontological criteria and empirical claims to contend that a human organism comes into existence neither earlier nor later than the moment of gastrulation: 16 days after conception. Several response papers have challenged S&B’s empirical claims to argue that the onset of the organism happens *earlier*: at, or a few days after conception.[[1]](#footnote-1) This paper makes a radically different claim: applying S&B’s ontological criteria properly, the human organism starts much later. To be precise: at birth. The main point of contention is a commonly overlooked but deeply relevant question: whether the fetus is or is not part of the maternal organism. S&B argue that it is not; I demonstrate that it is. This claim in combination with S&B’s own criteria commits to the view that human organisms begins at birth.

In section 2 I outline S&B’s account or the organism, and the reason they arrived at their original, 16 day answer. This identifies the core question at stake: is the fetus/embryo part of the maternal organism? In section 3 I closely examine fetal-placental anatomy to defend my answer: the fetus is part of the maternal organism. Section 4 concludes.

Before we start, however, note the following terminology and other clarifications: like S & B I use the term ‘foster’ to designate the embryo/fetus at any stage of its development.[[2]](#footnote-2) I am also entirely in agreement with S&B (2003, 46) that ours is an exercise in metaphysics, from which no moral claims follow without substantial further premises. Finally I use the term (human) organism throughout, consistent with my interests elsewhere[[3]](#footnote-3). Smith & Brogaard, like many others in this journal[[4]](#footnote-4), use *human being*,which they propose is synonymous with *human organism* and *human individual[[5]](#footnote-5).*

**II. SMITH & BROGAARD ON ORGANISMS AS SUBSTANCES.**

S&B provide us with a metaphysical picture that characterises organisms as topologically connected, persisting, physical *objects*, that exhibit certain necessary properties: an organism is a *substance* in the Aristotelian sense, a “three dimensional spatially extended entity, which exists *in toto* any time it exists at all” (2003, 47).

In this paper I neither endorse nor defend S&B’s account of the organism, nor indeed their specific brand of substance ontology. For the sake of argument I shall take both as given, though it should be noted that alternatives are available.[[6]](#footnote-6) The task I set myself is a restricted one: to test their application to the question at hand: when does the human organism come into existence?

S&B propose that, to be a substance, something must meet the following six conditions (2003, 47). In my words, it:

(1) can undergo change;

(2) must either stay numerically the same substance or cease to exist;

(3) can have spatial parts some of which can be added, lost and changed over time;

(4) has a complete, connected external boundary which separates it from other substances;

(5) is internally connected; and

(6) is an independent entity[[7]](#footnote-7).

Organisms are a subset of all substances that meet four additional criteria that identify organisms as a “unified causal system that is relatively isolated from its surroundings” (2003, 49). In my words:

(7) it has an external boundary that is “established via a physical covering or membrane” (2003,49), such that

(9) it serves as a barrier or shield;

(8) sequences of events within it are often cyclically repeated and it depends upon these falling within a limited range of values[[8]](#footnote-8); and

(10) it has mechanisms to reestablish and maintain these sequences and thus itself.

S & B assert that everything that “satisfies conditions 1-10 […], is of human decent and a product of normal foetal development, is a human being”(2003, 51). Because there is little in S & B’s ontology that is specific to humans, we can, presumably, modify their statement to ‘everything that satisfies conditions 1-10 above and is of mammalian/organismic/*species x* decent and a product of species-normal development, is a mammal/organism/member of *species x*’.

When, according to this framework, do human – or indeed any other mammalian – organisms start? S&B contend the following answer: when the process of *gastrulation* starts, sixteen days after conception[[9]](#footnote-9).

S&B contend that the organism does not start *earlier* than gastrulation, for familiar reasons[[10]](#footnote-10): prior to gastrulation the foster can split to grow into multiple babies (mono-zygotic twinning) and it can also still survive the removal, rearrangement and addition of cells. Upon and/or after gastrulation this starts to become either impossible or seriously disruptive to the development of the organism. This, S&B argue, signifies that, prior to gastrulation, there is not yet an organism: cells do not yet hang together in a way that forms a unified causal system (criteria 7-10); they do not yet depend on each other in the right way. As S&B put it: it “ceases to be a cluster of homogenous cells and is transformed into a single heterogeneous entity – a whole multicellular individual living being which has a body axis and bilateral” (2003, 62). Gastrulation – according to S&B – is the *substantial change* from a clump of cells into an organism.

Responses to S&B follow familiar lines of argument in criticising this view: they claim, for example, that S & B misunderstand the degree of cohesiveness, or communication between, or differentiation in the pre-gastrulation foster.[[11]](#footnote-11) Or they claim that twinning is determined earlier than gastrulation, and that its possibility alone – as opposed to its actuality – does not block numerical identity.[[12]](#footnote-12) Such criticisms push an earlier beginning of the organism; at, or a few days after, conception.

I, however, want to focus on a question about embryology that has received much less attention. This is the reason that S&B give for thinking that the organism does not start later than gastrulation. They provide two such reasons. The first is *intrinsic* to the foster: any further changes after gastrulation – such as neurulation, the acquisition of organs, hands, feet, etc –, S&B argue, are not substantial changes that change the foster into a new substance, but changes that the foster undergoes *as* a unified causal system and human being (criterion 1). The second reason is the one that interests me here, and is *extrinsic* to the foster. S&B consider but emphatically reject the idea that the foster is part of the pregnant organism. Birth, they claim, is *not* a substantial change, but “the mere passage of an entity from one environment to another (it is analogous to an astronaut leaving her spaceship)” (2003,65). The question of whether the foster is part of the maternal organism or not is relevant because, on S&B’s framework, if the foster *were* to be part of the maternal organism, then this would violate criterion 4: having a complete external boundary that separates it from other substances. If the foster was part of the maternal organism, then it would not be separated from other substances, and not be a substance in its own right. As S&B (2003, 47), write in their explanation of this criterion: “Substances are distinguished, […] from the undetached parts of substances. The latter can become substances, but only through becoming detached.” This they reassert e.g. (2003, 53) “We might attach a new tail to a tailless cat. Before the attachment, cat and tail are separate substances. As a result of the attachment, what had been a separate substance is now a part of the cat.”

Whether S&B are correct to claim that the foster is not part of the maternal organism is not scrutinised in the literature; indeed the question of the metaphysical relationship between the fetus and the maternal organism has been barely been touched upon in philosophy.[[13]](#footnote-13) We shall discuss it here.

**II. IS THE FOSTER PART OF THE MATERNAL ORGANISM?[[14]](#footnote-14)**

The foster is evidently inside the maternal organism, and directly involved in its physiological processes. Why do S&B think that it is not a part of the maternal organism? They invoke the concept of a *niche*. A *niche* “is a part of reality into which an object fits, and into and out of which the object can move” (2003, 70).[[15]](#footnote-15) S&B maintain that substances *s* can be inside other substances *S*, without being part of *S*, iff *S* contains a *niche* that contains *s* as an occupier or *tenant.* Pregnant organisms, S&B argue, contain a niche of which the foster is a tenant. Therefore fosters are not proper parts of the maternal organism, but, instead, substances in their own right.

Are fosters tenants? Can they move in and out of their niche? At first sight the answer is: no, at least not easily. Birth is irreversible; once a baby is out, it does not go back in. Nobody has yet successfully transplanted a foetus[[16]](#footnote-16), and even if we *did* gain the technology to transplant fosters, that would not change things. For consider hearts and kidneys; although we have the technology to transplant these, that does not stop us from considering them parts of the organism, rather than tenants in niches. These organ transplants are possible, but they are exceedingly difficult and risky – and that is precisely *because* they remove and insert parts of organisms which involves severing major connections. The same will apply should we be able to transplant fosters.

On S&B’s initial intuitive formulation of the tenant-niche relation, then, the foster does not appear to be a tenant in a niche. But S&B (2003) did not discuss this initial intuitive formulation when discussing the foster. Instead they focused on three further characteristics for the tenant-niche relationship that, they argue, *do* apply to fosters. Niches and tenants:

(1) “do not overlap (they have no parts in common)” (2003, 70);

(2) “share no boundaries” (2003,7);

(3) “must involve some sort of cavity […] in which the tenant is contained. The tenant is then separated via this medium from any surrounding physical retainer” (S&B 2003, 70).

A fish inside an aquarium illustrates the application of these criteria. Although the fish is *inside* the aquarium it is not *part of* the aquarium; rather it is a tenant in a niche. Not only because fish can be moved in and out of the aquarium, but also because (1) fish and aquarium do not share parts; (2) fish and aquarium do not share an external boundary; and (3) fish are in a [water-filled] cavity in the aquarium.

Based on these criteria, S&B proceed to give two arguments to convince us that fosters are tenants in a niche. First, and corresponding to criterion 2, they assert that a foster has its own, completely connected external boundary, marked by a physical discontinuity between foster and mother; “there is at no stage after ovulation a strict topological connection between the foster and its mother” (2003, 73). And, describing gastrulation: “it is from this point that the foster constitutes a single substance with its own *external physical boundary*” (2003,73, *my emphasis*). Second, and corresponding to criterion 3, they focus on the role of the amniotic cavity that “includes” the foster analogous to “a palm kernel that is lodged within your digestive tract” or “the kangaroo joey that is lodged inside its mother’s pouch” (2003,74).

Our task, then, is to assess these arguments and criteria in light of the empirical data to examine whether fosters can be considered a tenant in a niche, in spite of their apparent inability to move in and out of the niche. Doing so requires us to consider the boundaries of the foster. But that raises an important question: what *are* the boundariesof the foster? The answer to this question is less than straightforward. Rather than defending a definite answer – and hence my case being only as good as that defence – my strategy will consist in identifying the three most plausible candidates for delineating a foster. I will then argue that on each of these, arguments and criteria that purport to show that the foster is a tenant in a niche, fail.

*Three Conceptions of the Foster*

Here are three possible conceptions of the foster and its boundaries. I label these the ‘*Future Baby’* (FB), the *‘Baby with Placenta’* (BP) and the *‘Chorionic Content’* (CC).

The *Future Baby* consists of *only* that part of the pregnancy material that will emerge as the future baby. On this view, the boundaries of the foster are given by the membrane/skin covering the future baby, perhaps (although this is not relevant for the argument) the lining of the fosters’ oesophagus, trachea and gut, and – and this is important – a boundary somewhere along the foster’s umbilical cord – roughly where that cord will be cut after birth, or perhaps even at the umbilicus, where the remainder of that cord will fall off about a week later.

The *Baby with Placenta* consists of the future baby *plus* the umbilical cord and placenta, which, on this view, is part of the foster. The boundaries of the BP are, again, the future baby’s intestinal lining and skin. But this time, to trace the boundaries of the foster, we do not stop at the umbilical cord, but we follow the skin which becomes the membranes surrounding the umbilical cord, which then branch outwards again to become the membrane – the amnion – that covers the fetal side of the placenta. To capture the whole placenta we cannot follow the amnion – which loops back on itself to surround the amniotic cavity. Instead we must trace a boundary at the maternal side of the placenta - perhaps at the rough locus of the placenta’s future separation – to capture the whole placenta.

The *Chorionic Content* consists of *all of* the pregnancy material as surrounded by the chorion and derived from the zygote: i.e. this includes the ‘future baby’, the umbilical cord, the placenta, the amniotic fluid, the amniotic and chorionic membranes – the lot. On this view the boundaries of the foster are given by the chorion and – again – by the maternal side of the placenta.

Let’s consider, for each of these views, how S&B’s arguments in favour of the tenant-niche relationship apply, and whether the foster meets S&B’s criteria for being a tenant in a niche. Remember, for this assessment that S&B define boundaries as physical discontinuities: “boundary […] refers to an abrupt threshold between the matter of normally lower density (air or water) in the space surrounding the individual and the matter in the individual’s interior” (2003,47). In organisms, such boundaries are “established via a physical covering or membrane” (2003, 49).

1. The Future Baby View

The Future Baby View requires that we recognise a boundary to the foster at the umbilicus or a little further along the umbilical cord. This requires a boundary at a place where, prior to birth, there is continuous tissue and even continuous flow of blood; through the umbilical cord flow one artery that transport relatively oxygen/nutrient-arm blood to the placenta, and two veins that – following intra-placental exchange of nutrients, oxygen and waste between maternal and fetal blood – transports oxygen and nutrient-rich blood back to the foster. This flow of blood through major vessels in the umbilical cord is essential to the foster’ life and development.

Now consider S&B’s positive arguments in favour of the tenant/niche view of fosters. First, they assert that that a foster has its own, completely connected external boundary, marked by a physical discontinuity between foster and mother. “[T]here is at no stage after ovulation a strict topological connection between the foster and its mother. Such a connection is not even established in the form of a canal or tube through which blood or nutrients might flow” (2003, 73). At the level of the umbilicus/umbilical cord, this is clearly false; there topological connection, and *no* physical discontinuity, between mother and FB-foster. And the umbilical surely is the very example of a “canal or tube through which blood or nutrients might flow”. Just like there is a topological connection between tail and cat until tail is physically severed, there is a topological connection between FB and pregnant organism at the level of the umbilicus/umbilical cord until the umbilical cord is severed after birth. S&B’s first argument does not apply.

Second, S&B discuss the “amniotic cavity in which the foster is lodged” (2003: 74). But unlike a fish in an aquarium, the FB is not wholly and freely floating inside that cavity. Instead she is only *suspended* in that cavity, whilst still being (topologically) connected to the pregnant organism by a (very important) ‘stalk’. Is suspension enough for meeting the tenant-niche criterion? I think not. First, being suspended into a cavity is not the same as being surrounded by a cavity – the latter indicates topological separation whereas the former does not. Second, consider that very many parts of my body are *suspended* in fluid filled cavities or spaces and only connected to the rest of my body by a stalk: my ears, tongue, uvula, kidneys, lungs, pancreas and testes – to name but a few.[[17]](#footnote-17) Indeed S&B quite clearly *recognise* that this is the case[[18]](#footnote-18) *and* make clear that such systems are proper parts of us, and not a tenant in a niche[[19]](#footnote-19). Just as these organs being suspended in a cavity whilst being connected by a stalk does not stop topologically connectedness or organismic parthood, it does not for FB’s. S&B’s second argument also does not apply.

The existence of the umbilical cord thus means the ‘future baby’ fails to meet S&B’s three criteria for being a tenant: on the future baby view (1) fosters and pregnant organisms may have parts in common – namely the arteries, veins, membranes and glutinous tissue that form the umbilical cord as well as the blood that flows through them; (2) foster and pregnant organism certainly share an external boundary: whatever boundary S&B propose to draw along the umbilical cord or at the umbilicus; and (3) foster and pregnant organism are not separated by a cavity.

So, *either* the tenant niche relationship does not apply to the ‘Future Baby’ conception of fosters, and fosters are part of pregnant organisms, *or* the future baby conception of the foster is not what S&B had in mind.

2. The Baby with Placenta View

On the Baby with Placenta View, the foster largely has the same boundaries as the Future Baby view, but includes the umbilical cord and placenta. Because the placenta tends to be a relatively unfamiliar organ that receives (too) little discussion in the philosophical literature, let me provide a brief introduction.

The human placenta is an organ of maternal-fetal origin that facilitates exchange between the maternal and fetal blood supplies. The foster absorbs oxygen and nutrients from the mother in exchange for waste products. The placenta is also an endocrine organ involved in control and physiological manipulation of the pregnancy. The placenta is formed initially by zygote-derived trophoblastic cells that invade the *decidua* – the thick, loose and well-vasculated maternal tissue that lines the uterus and that, in the absence of pregnancy, is shed in the monthly menstrual cycle. The zygote-derived trophoblastic cells line the maternal blood-vessels in the decidua – the spiral arteries – and remodel them so that they dilate and form cavities internal to the placenta. In these cavities protrude tree-like structures or branching fingers– villi – through which fetal vessels flow. In the villi fetal capillaries are separated by only a few layers of cells from the flee-flowing maternal blood; this is where the exchange of nutrients takes place. The branched structure of the villi and fetal vessels greatly increases the exchange surface between maternal and fetal blood. At birth the placenta weighs about 500 grams. It is born after the baby, when it separates from the uterine wall in the spongy tissue of the decidua basalis.

Now apply S&B’s positive arguments in favour of the tenant/niche view of fosters to the BP view. The first of these is that a foster has its own, completely connected external boundary, marked by a physical discontinuity between foster and mother and a lack of topological connection. The BP view posits such a boundary somewhere on the maternal side of the placenta. Where would that be? To find an answer, let’s systematically review the tissue-layers of the placenta:

The fetal side of the placenta, where the umbilical cord attaches, is covered by a membrane: the amnion. The amnion continues all around to form a ball: the amniotic sac, filled with amniotic fluid. It also connects with the membrane covering the umbilical cord and eventually the skin of the foster. All of this is tissue derived from the epiblast.

After the amnion there is a layer of foster-derived connective tissues permeated by many fetal blood-vessels: the mesenchyme. This tissue derived from extra-embryonic mesoderm that migrated out of the embryonic disc[[20]](#footnote-20), through the connecting stalk – what would later become the umbilical cord – to reside in between the amnion and the trophoblast-derived chorion. Mesenchym makes, amongst others, the fetal vasculature as well as e.g. muscles in the foster proper. This is the tissue that, so to speak, ‘fills’ the villi.

These villi are covered with the next layer of tissue: two layers of trophoblast-derived cells: the cytotrophoblast and the syncytiotrophoblast[[21]](#footnote-21). These are the cells that initially invaded the uterine wall, lining the maternal spiral arteries and remodelling them so as to form the intervillous spaces where maternal blood flows, and into which the villi protrude. Maternal blood thus is in direct contact with syncytiotorphoblast cells and flows through spaces modelled and controlled by these cells that line all of the intervillus space where maternal blood flows.

Some villi do not protrude in the intervillous space, but connect to the next layer of the placenta: the maternal side or decidua basalis. Here both the syncytiotrophoblast and the fetal mesenchyme directly border and connect to maternal connective tissue and cells.

Finally maternal-derived tissue lines the maternal side of the placenta. If one continues deeper into this *basal plate* – the maternal-facing and maternal-derived part of the placenta – past the place where the placenta will separate after birth, one keeps traversing further layers of maternal tissue before, ultimately, reaching the muscular tissues of the uterine wall.

So, where along the maternal side of the placenta would one draw a boundary between mother and foster? Naively, one might attempt to draw it between the cells of maternal and fetal origin. But that fails; first, fetal cell lineages colonise the maternal spiral arteries such that maternal and fetal cells intermingle and directly border eachother; second, maternal blood, including maternal cells, permeate cavities and parts of the placenta created, surrounded and maintained by embryonic cell lineages; third, in the anchoring villi, fetal mesenchyme and maternal connective tissue from one tissue that holds the placenta together. Fetal and maternal-derived tissue cannot be easily separated; there is no line here. Let alone the sort of boundary – marked by physical discontinuity in tissues – that S&B need for their argument. We are faced with continuous tissue and cell-cell connections instead.

Alternatively one might locate the boundary at the place of future placental separation. This is known as *Nitabuch’s layer* – an area of spongeous tissue in the basal plate. Later in the pregnancy, fibrinoid deposits start to appear at this locus. No only does this proposal – perhaps surprisingly – entail that the foster includes maternal tissue, but it is also utterly unconvincing. First, because there simply *is* no boundary here until placental separation starts; there is no membrane, let alone a physical discontinuity, here that separates the pregnant organism from the placenta *before* the latter physically separates at birth – any more than there is a physical discontinuity alongside my hair before the barber picks up a pair of scissors and creates one. There is simply continuous connective tissue, especially in the anchoring villus where fetal and maternal cells connect. Second, even if there was a boundary here, it is traversed by ‘tubes and canals’ through which blood and nutrients flow. Not one, this time, but very many; the maternal spiral arteries, lined and remodeled by embryonic cell-lineages. Through these tubes and canals flows maternal blood that is essential to the fosters’ livelihood. Severance at this point – after birth or (sometimes – and disastrously) before –leaves an open wound that is anything but insignificant.[[22]](#footnote-22)

What other options are there? One might – somewhat desperately – attempt to draw a boundary between the embryo-blast and tropho-blast derived cells: between the fetal mesenchyme and the trophoblast that covers it. First this is unconvincing in its own right. Again there is no physical continuity marking an external boundary here, as little as there is a boundary between the rest of our organism and our skin; what we have, here, again, is continuous tissue, marked by different kinds of connected layers. Second, it does not work: in anchoring villi the fetal mesenchyme is, later in pregnancy, no longer covered in trophoblast cells; it directly connects to maternal connective tissue.

There simply is no complete external boundary on the BP view; S & B’ assertions about complete external boundaries, physical discontinuity and lack of topological connection once again do not apply. In fact, if there ever was an example of *no topological boundary* or a *shared part* then the placenta is it: many body parts (brains, testes, nails, eyes) are surrounded much more clearly by membranes and fluid, and leave a much smaller wound when severed than the placenta; the placenta is continuous with, and literally grows out of [or into] the tissues lining the uterine wall.

What about S&B’s second argument, that foster and pregnant organism are separated by a fluid filled cavity? Such a cavity does not exist at Nitabuch’s layer, but one might attempt to locate cavities in the placenta at the separation between fetal and maternal blood-supply, that is between the villi on the one hand and the cavernous spaces filled with maternal blood in which they protrude on the other. There are indeed cavities here – filled with maternal blood. And, to top it off, there are indeed some membranes here separating the villi – and the fetal capillaries in the villi – from maternal blood. These membranes are not traversed by tubes and channels other than normal ones in membranes permitting osmosis and other forms of active trans-membrane transport. So there is a legitimate boundary here, as there is a legitimate boundary to be recognized anywhere in the body between the walls of the blood vessels and the blood flowing through it. But this is not a boundary separating foster and pregnant organism. Like bloodvessels, these spaces do not surround or bound the placenta or the maternal organism; they are internal to both, surrounded on all side by zygote-derived trophoblast. And, secondly, anchoring villi once again disprove this view.

The BP view does not meet any of the three additional conditions for being a tenant: 1) BP and pregnant organisme seem to have parts in common – namely the placenta which is often described as an organ of ‘maternal/fetal origin’, as well as, perhaps, the umbilical cord; (2) fosters and pregnant organism certainly share an external boundary: whatever boundary is drawn along the tissue that connects the placenta to the uterine wall; and (3) foster and pregnant organism are not separated by a fluid-filled cavity.

So, *either* the tenant niche relationship does not apply to fosters, and fosters are part of pregnant organisms, *or* the baby with placenta conception of the foster is not what S&B had in mind.

3. Chorionic Content

The chorionic content conception relocates part of the external boundary from the skin/amnion to the chorion – which does have many markers of an external continuous boundary. But it still, also, needs to draw a boundary around the placenta (because the placenta is, so to speak ‘outside’ – or perhaps more aptly ‘part of’ – the chorion). This view therefore faces the same difficulty as the BP view; the CC conception of the foster also fails to meet criteria for the tenant niche relationship.

So, *either* the tenant niche relationship does not apply to fosters, and fosters are part of pregnant organisme, *or* the chorionic content view is not what S&B had in mind.

*A possible come-back*

At this point, S&B would likely retort that external boundaries can never be complete: I have holes – pores in my skin, a urethra – and every single organism has ‘entry points’ through its external boundary by which it can exchange things with its environment. And, indeed, S&B note that an external boundary or membrane “typically contains small apertures – such as pores, mouth or nostrils – which allows interchange of substances such as air and food between interior and exterior” (2003, 49). But in the case of the placenta and umbilical cord we are not talking about exchange functions in an outer layer or membrane; there is no membrane surrounding the placenta on the maternal side, and the placental zone of fetal-maternal connectedness is traversed by *veins and arteries*, not pores or membrane pumps.

If such a response is to work, then the onus is firmly on S&B to give us a more adequate account of the distinction between topological connectedness and what I shall call ‘pore’- connectedness, where pores are the sort of openings that are compatible with continual external boundaries. They also have to explain why, by their own criteria and *on topological* grounds, the foster is different from organs and other body-parts that also have a stalk-morphology. And we need an argument why the umbilical cord should be seen as a ‘pore’ in the foster’ skin, rather than the topologically connecting stalk containing main arteries, veins and other main transport channels, that is so common in our anatomy, and that it so obviously is. For the placental surface is anything but a “small aperture” in the chorion. Without such an argument, this response is not convincing.

To conclude, either foster and pregnant organism do not stand in a tenant-niche relation – meaning that fosters are part of pregnant organism – or S&B must have had another conception of the foster in mind than the three I discussed. Such a conception would have to delineate the foster in such a way that no boundary is drawn anywhere between umbilicus and uterine wall. I, for the life of me, cannot imagine what such a conception would be – but I am open to suggestions.

**III. CONCLUSION AND DISCUSSION.**

Smith & Brogaard’s criteria for being a substance – and an organism – place important weight on the possession of a complete external boundary. This “separates it spatially from other substances” and distinguishes substances “from the undetached parts of substances”. A close examination of pregnant anatomy and physiology has revealed that the foster does not have such an external boundary; up until birth it is topologically connected to the maternal organism. On Smith & Brogaards view this makes it a part of the maternal organism, and therefore neither a substance, nor an organism, in its own right.

If we accept Smith & Brogaard’s criteria for being an organism, then this gives a precise answer to the question when human organisms – or, as Smith & Brogaard put it, human beings – begin: at birth.[[23]](#footnote-23) Note that this argument is not outweighed or superseded by earlier responses to Smith & Brogaard that contended that the organism started earlier than sixteen days. Those arguments emphasized organizational and causal unity and contended that these are present earlier than Smith & Brogaard acknowledge; prior to gastrulation. But if the foster is part of maternal organism, then it is irrelevant on Smith & Brogaard’s framework how organized or causally unified the part is; being part of the maternal organism always entails that something cannot be an organism or substance in its own right. Insofar as these other arguments work with – rather than reject – Smith & Brogaard’s criteria, they can therefore not show that the human being starts prior to birth.[[24]](#footnote-24)

To conclude: in the context of Smith & Brogaard’s framework, birth is not a mere change of location, but a substantial change. A change, to be precise, that Smith & Brogaard would recognise as budding: “a part of one individual substance becomes detached and forms a new individual substance in its own right while the original substance goes on existing” (2003, 53). Birth marks the beginning of the human, and any other mammalian, organism. Given that most discussion of the start of organism – especially those focused on substance ontology – have contended dates very close to conception I suspect this is seen as a surprising, perhaps radical proposal. It entails that a severely premature, barely-on-the cusp of viability baby is a human being/organism, whereas a flourishing 4kg overdue foster, about to be born in robust chances of survival, is not. That seems odd. But it is only odd if we secretly adhere to an account of the human organism based on something like psychological capabilities. On the particular brand of substance ontology that Smith & Brogaard advocate, where extrinsic characteristics matter, this should not be surprising at all. For on that view it is only an organism once it is born; once it is a separate substance.

Even so I don’t expect the beginning at birth view to attract many followers. Since my argument only contends that humans begin at birth *if* we accept Smith & Brogaard’s criteria for organisms, one way to avoid the beginning at birth view is to reject some or all of Smith & Brogaard’s framework. There are different ways of doing this. One could, for example, reject the emphasis that Smith & Brogaard place on boundaries in the individuation of substances. That may avoid the conclusion that the fetus is a part of the maternal organism.[[25]](#footnote-25) But then it may not; I argue elsewhere that the foster is part of the maternal organism on grounds other than topological considerations.[[26]](#footnote-26) One could also reject the view that (undetached) parts of substances could never be substances. There is a precedent for this; Hoffman & Rosenkrantz (1994) propose a brand of substance ontology where substances can be parts of other substances.[[27]](#footnote-27) On such a view of substances, the foster’s being part of the maternal organism does not block numerical identity between foster and baby. On such a modification human beings can begin prior to birth, albeit as parts of other organisms.[[28]](#footnote-28) There will be other possible ways of modifying or rejecting part (or all) of Smith & Brogaard’s framework. But without any such modification, Smith & Brogaard are committed to the claim that it is logically impossible to terminate a human being through abortion[[29]](#footnote-29). Whether that convinces of that claim, or of the need for modification of their criteria, is something I leave for the reader to decide.[[30]](#footnote-30)

**References**

Anscombe, G.E.M. 1984. Were you a zygote? *Royal Institute of Philosophy Lecture Series* 18: 111-115.

Alvargonzalez, D. 2006. The Constitution of the Human Embryo as Substantial Change. *Journal of Medicine and Philosophy* 41: 172-91.

Damschen, G., Gomez-Lobo, A., and & Schoenecker, D. 2006. Sixteen days? A reply to B. Smith and B. Brogaard on the Beginning of Human Individuals. *Journal of Medicine and Philosophy* 31: 165-75.

Ford, N.M. 1988. *When did I begin? Conception of the human individual in history, philosophy and science.* New York: Cambridge University Press.

George, R. P. and C. Tollefsen. 2008. *Embryo: A Defense of Human Life*. New York: Doubleday.

Harris , J. 1998. *Clones, Genes & Immportality*. Oxford: OUP.

Hoffman, G., and Rosenkrantz, G.S. 1994. *Substance among other categories.* Cambridge: Cambridge University Press.

Kingma, E. (forthcoming A). Were you a part of your mother? The metaphysics of pregnancy. *Mind* -:--

Kingma, E. (forthcoming B). Lady Parts: the metaphysics of pregnancy. *Royal Institute of Philosophy Supplement* -:--

Koch-Hershenov, R., 2006. Totipotency, Twinning and Ensoulment at Fertilisation. *Journal of Medicine and Philosophy* 31: 139-164.

Lee, P., Tollefsen, C., and George, R.P., 2014. “The ontological status of the embryo: a reply to Jason Morris.” *Journal of Medicine and Philosophy, 39*: 483-504.

Larsen, W.J. 1997 *Human Embryology.* New York: Churchill Livingstone.

McMahan, J. 2007. Killing embryos for stem cell research. *Metaphilosophy* 38:170–89.

Morris, J. Substance Ontology cannot determine the moral status of embryos. *Journal of Medicine and Philosophy.* 37: 331-350.

Smith, B. and Brogaard, B. 2003. Sixteen Days, *Journal of Medicine and Philosophy* 28: 45-78.

Smith, B., and Varzi, A. 1999. The Niche *Nous* 33:198 -222.

1. E.g. Damschen et al. 2006, George & Lee (2008), Koch-Hershenov (2006). [↑](#footnote-ref-1)
2. Smith & Brogaard (2003, 45); See also Kingma (forthcoming A). I [↑](#footnote-ref-2)
3. Kingma (forthcoming A) [↑](#footnote-ref-3)
4. e.g. Alvargonzalez (2016), Damschen et al (2006), Koch-Hershenov (2006), Lee, Tollefsen & George (2014), Morris (2012). [↑](#footnote-ref-4)
5. Smith & Brogaard (2003,46) [↑](#footnote-ref-5)
6. See e.g. Hoffman & Rosenkrantz (1994) [↑](#footnote-ref-6)
7. In the sense that they do not require other entities as their ‘bearers’ or ‘carriers’, such as a smile which needs a face to bear it, or a belief which needs a brain/mind to instantiate it. [↑](#footnote-ref-7)
8. This criterion bears a strong resemblance to traditional ideas of homeostasis. [↑](#footnote-ref-8)
9. In the remainder of this paper I take a certain familiarity with embryogenesis and its terminology for granted. Here is a short recap: sperm and egg merge to become a *zygote*. Through cleavage (i.e. cellsplitting without growth) the zygote becomes a multicellular *morula,* which then, around day 3, develops a cavity in the middle (the blastocoel) to become a *blastula*. The blastula hatches from the zona pellucida that surrounded the egg and becomes a *blastocyst.* The outer cells of the blastula are called the *trophoblast*, the inner cell mass is the *embryoblast.* The trophoblast cells starts to *differentiate* (= embark on a specialised developmental pathways) into *cytotrophoblasts* and *syncytiotrophoblast*s. These are the cells that will invade the uterine lining, which allows the embryo to implant (day 5).

   After implantation the trophoblast continues to invade the uterine lining, pulling the developing embryo in and starting to remodel the maternal blood vessels to begin to form the placenta and what will later be the *chorion* – the outer embryonic membrane. The embryoblast, during this second week, splits into two layers which go on to form two adjacent ‘balls’ – each with a cavity in the middle: the *epiblast*, which surrounds what will be the amniotic cavity, and the *hypoblast*, which surrounds what will become the yolk sac. Where epiblast and hypoblast meet is the *embryonic disc*.

   At *gastrulation* – around 14-16 days - the embryonic disc differentiates into three layers; the *ectoderm* (which gives rise to future skin and nervous system); the *mesoderm* (which gives rise to most internal organs and the vasculature); and the hypoblast becomes the *endoderm* (gastro-intestinal linings)*.* This is also when the *primitive streak* appears.

   *Neurulation* starts around 21 days, when the dorsal epiblast begins its own folding process to form a neural groove, ridge and eventually tube; the start of the nervous system. The embryo also starts folding to become, by the end of week four, a three dimensional structure that eventually will have endoblast-derived tissue as it inside lining, and is entirely covered in epiblast-derived skin.

   By the end of 8 weeks the embryo is almost fully formed, having all organs, limbs, digits etc in place; from now on it is known as a *foetus*.(Larsen, 1997)

   Early embryogenesis is developmentally very robust, and strikingly similar for all mammals – indeed all vertebrates. [↑](#footnote-ref-9)
10. See also e.g. Anscombe (1984), Ford, (1998), Harris (1998), McMahan (2007). [↑](#footnote-ref-10)
11. Damschen et al. (2006). See also e.g. Oderberg (2008). [↑](#footnote-ref-11)
12. Koch-Hershenov (2006). See also e.g. Oderberg (2008). [↑](#footnote-ref-12)
13. Kingma (forthcoming A). [↑](#footnote-ref-13)
14. An abbreviated version of the arguments in this section appears in Kingma (forthcoming B). [↑](#footnote-ref-14)
15. See also Smith & Varzi (1999). [↑](#footnote-ref-15)
16. After implantation, that is. Before implantation this is a different matter, as IVF illustrates. In fact, the observant reader will realise that prior to implantation the arguments offered in this paper, which rely on topological connection, become decidedly shaky. I cannot discuss this in detail here, but (briefly) my current (unconsidered and undefended) view is that IVF embryos are not part of the maternal organism, until implanted, but that ‘normally’ conceived embryos are part of the maternal organism throughout because the peritoneal cavity/uterus are most sensibly thought of as spaces internal to the maternal organism. If that turns out to be incorrect then my arguments in this paper are restricted to the period between implantation and birth. See also (Kingma, forthcoming A). [↑](#footnote-ref-16)
17. Indeed the clearest example I can think of, of complete suspension in a fluid-filled cavity, are blood-cells…. [↑](#footnote-ref-17)
18. “The heart and lungs, too, are separated from each other by appropriately constructed membranes (pericardium, pleura), which shield the processes occurring within them from the outside influences. These systems are not absolutely closed off from each other. Rather, again, they are partially open and partially shielded.” (2003, 51). [↑](#footnote-ref-18)
19. “For consider John’s heart. This is […] a relatively isolated causal system; […] it belongs as a proper part to John’s organism as a whole.” (2003,69). [↑](#footnote-ref-19)
20. This theory is still controversial; it may also have a contribution from the trophoblast. Larssen (1997). [↑](#footnote-ref-20)
21. In mature villi there is often only one layer left. [↑](#footnote-ref-21)
22. Half the maternal blood volume passes through the placenta each minute and up to 500 ml of blood loss – half a liter or 10% of one’s blood volume – is considered normal in human birth. This blood-loss is stemmed because, after placental separation, the uterus rapidly contracts thus reducing the size of the wound and constricting the blood flow. If that uterus contraction fails to happen, humans can, used to regularly, and still do occasionally, bleed to death. [↑](#footnote-ref-22)
23. I may be seen to overstate the precision here. Birth is a process; what *exactly* marks birth? (Is it the cutting of the umbilical cord? The cessation of blood flow in the umbilical cord? The first breath? And so on.) I don’t think this is a problem. We can equally mark death as a substantial change – as the cessation of the organism – whilst remaining agnostic or even in disagreement what *exactly* marks death. (Is it the cessation of the heartbeat? The absence of brainstem activity? Etc. ) [↑](#footnote-ref-23)
24. With the exception of – perhaps – the period prior to implantation. (see my footnote 12). If the foster is claimed not to be part of the maternal organism prior to implantation *and* if Smith & Brogaars’s criteria are accepted in full, then the arguments in this paper still demonstrate it becomes such a part upon implantation. This raises questions that are beyond the scope of this paper. [↑](#footnote-ref-24)
25. I am grateful to an anonymous reviewer of this journal for pushing me on this point. [↑](#footnote-ref-25)
26. Kingma (forthcoming A). [↑](#footnote-ref-26)
27. I am grateful to an anonymous reviewer of this journal. [↑](#footnote-ref-27)
28. See also Kingma (forthcoming B). [↑](#footnote-ref-28)
29. Not considering abortions that inadvertedly kill the mother. [↑](#footnote-ref-29)
30. I am grateful to Barry Smith, Rohan Lewis and Peter Skuce; to audiences at the December 2013 Southampton Philosophy Research Day, the 2014 BSPS conference (Cambridge, UK) and the 2016 PANTC conference (Buffalo, NY); and to members of the BUMP research group – Teresa Baron, Siggy Schilpzand, Suki Finn, Alex Geddes and Jonathan Grose – for useful questions, correspondence and discussion. This project has received funding from the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation programme (grant agreement No 679586).  [↑](#footnote-ref-30)