Chapter 10
Fetal Pains and Fetal Brains

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There has been a groundswell of recent scholarship on the question of whether or when unborn humans become capable of feeling pain.[1] (Anand and Hickey, 1987; Colette, 2003; Commission of Inquiry into Fetal Sentience, 1996; Derbyshire, 2006, 2008; Glover, 1999; Glover and Fisk, 1996; Kolenc, 2006; Lagercrantz and Changeux, 2009; Lee, Ralston and Drey et al., 2005; Lowery, Hardman and Manning et al., 2007; Mellor, Diesch, Gunn and Bennet, 2005; McCullagh, 1997; Myers, 2006; Royal College of Obstetricians and Gynaecologists, 2010; Saunders, 1997; Savell, 2007; Sonfield, 2005; Stahle, 2007; and Wenger, 2006, among others.) The reason for this rapidly growing literature is not difficult to discern: if unborn human beings are capable of feeling pain, this fact would have potentially enormous implications for how unborn humans ought to be treated, whether in the context of fetal surgery, embryonic and fetal experimentation,[2] or induced abortion (hereafter, 'abortion'). At least for the time being, the practical issues concerning fetal surgery and fetal experimentation have been largely settled. In the first instance, *whether or not* fetuses are capable of feeling pain while undergoing surgical procedures, *not* providing anesthesia during fetal surgery appears to have enough *other* untoward (stress-related and behavioral) effects on the fetus that anesthetizing human fetuses who are undergoing surgery (thanks, primarily, to the work of Anand, Sippel and Aynsley-Green, 1987) has quickly become the standard of care. In the second instance, potentially destructive research on unborn humans has, thus far, only seriously been entertained in *very* early human embryos that, everyone agrees (or at least everyone *should* agree), are too young to feel pain. The primary issue, therefore, currently controlling this discussion concerning fetal pain sentience is the issue of *abortion*. Because methods devised for killing unborn humans include some (e.g., ripping, scraping, burning, breaking, crushing, poisoning, and cutting) that might elicit pain in those beings on whom these methods of killing are employed, the question concerning whether or when human fetuses can feel pain has become a matter

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S. Napier (ed.), *Persons, Moral Worth, and Embryos*, Philosophy and Medicine 111,
DOI 10.1007/978-94-007-1602-5_10,

of significant clinical, ethical, and, more recently, legal urgency.[3] (Collett, 2003; Stahle, 2007)

I plan, in Part I of this essay, to argue that *whether or not* one concludes that human fetuses are capable of feeling pain (i.e., whether or not one concludes that human fetuses are 'pain sentient'), *or* whether one concludes that there remains radical (even *ineliminable*) uncertainty regarding whether or not human fetuses can feel pain, *any* one of these three conclusions can be profitably recruited in the service of various ethical arguments against the intentional killing of unborn humans. In Parts II and III, I argue that there is good reason to believe that unborn humans as early as the latter half of the first trimester of pregnancy, are capable of feeling pain based on (i) demonstrable early fetal behavioral responses to noxious stimuli, (ii) an acceptable threshold of neurobiological maturation under conditions of uncertainty regarding the presence, degree, or absence of fetal subjectivity, and (iii) an application of arguments concerning the general problem of 'other minds' specifically to the brains and pains of fetuses. In Part IV, I provide some concluding reflections on fetal pain sentience and abortion.

10.1 Part I

According to the Committee on Taxonomy of the International Association for the Study of Pain (IASP), 'pain' is defined as, "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (IASP, "Pain"). Lowery and colleagues (2007, p. 275) call this "[t]he most commonly accepted definition of pain."[4] For reasons that differ from those of Anand and Craig (1996), I find this proposed definition to be inadequate. First, it is unclear what the term 'sensory' adds to the definition. In fact, in light of there being well-described cases of *psychogenic* pain, it is clear that not all pain is (at least proximally) derived from sensory receptors. Second, it is unclear how the term 'emotional' is to be understood in this context and, depending on how it *is* understood, its inclusion in any definition of pain could be profoundly misleading. Our emotional life is very rich and highly complex. Just how much of this richness and complexity is being presupposed in the IASP definition of 'pain'? If one builds in *too much* richness and complexity, then many lower brute animals that do not appear to have a rich and complex emotional life would not be considered to be *pain* sentient in spite of the fact that they appear clearly to be sentient in *other* experiential domains (sight, for example or hearing, or echolocation). On the other hand, perhaps, if we accept the IASP definition's commitment to there being an emotional component to pain, we might also be committed to attributing an emotional life to frigate birds or Northern Pike or terrapins. If we do this, to *how much* of an emotional life in these creatures would we be committed?

The *JAMA* authors (2005),[5] for example, go to great lengths to emphasize the 'emotional content' of pain in a manner that significantly distorts the discussion concerning investigations into fetal pain, pushing it forcefully in the direction of endorsing only *late third trimester* fetal pain sentience. They state, "Because

pain is a *psychological construct with emotional content*, the experience of pain is modulated by changing emotional input and may need to be learned through life experience," adding, "Regardless of whether the emotional content of pain is acquired, the psychological nature of pain presupposes the presence of functional thalamocortical circuitry *required* for conscious perception" (2005, p. 949, emphasis added). The only 'presupposing' going on here is the *JAMA authors*' presupposing that the presence of functional thalamocortical circuitry is *required* (as opposed to being, for example, *a normal concomitant* of pain perception in *adult* humans) for conscious pain perception (a thesis that, as I see it, appears to have been thoroughly discredited) *and* presupposing that, in some sense, pain is a "psychological construct with emotional content. . ." (2005, p. 949). What, precisely, do they mean by this latter locution? Well, they gesture toward how pain experience is modulated by emotional inputs. That there is such *modulation* of pain by emotion is uncontroversial, but how is this *relevant* to the issue of pain's being a "psychological construct" with specifically emotional *content*? Well, the *JAMA* authors (2005) go on to add that pain experience "*may* need to be learned through life experience" (2005, p. 949). Of course, *naming something a 'pain'* as opposed to a 'tickle', for example, is something that *is* "learned through life experience." But what does it mean to say that *pain experience itself* might need to be learned in this way?

Stuart W.G. Derbyshire (1999, 2006, 2008) has argued vigorously that *relatively extensive exposure to, and interaction with, the extrauterine world after birth*, including appropriate interactions with linguistically competent interlocutors, is *required* for pain sentience. In other words, Derbyshire seems to believe that a *more general* form of (preconscious) exposure and interaction is required for more specific (conscious) *pain* sentience—postnatal exposure and interaction that provide *essential contents* of general consciousness required for later pain experience. He writes, "A proper *understanding* of pain must account for the *conceptual content that constitutes* the pain experience" (2006, p. 911, emphasis added). He then goes on approvingly to cite the IASP, adding that, by its "definition pain is not merely the response to noxious stimuli or disease" (as if anyone would think otherwise), "but is a conscious experience," (as if there could not also be *unconscious* pains[6]) after which he notes, "The definition further states that 'pain is always subjective. *Each individual learns the application of the word through experiences related to injury in early life*'" (2006, p. 911, emphasis added). Derbyshire, thereby, hand in hand with the IASP, confusedly slides from the *experience* of *pain* to the *application* of the *word* 'pain', and, in part, as a result of this conceptual confusion concludes that, "The limited neural system of fetuses cannot support such cognitive, affective, and evaluative experiences; and the limited opportunity for this content to have been introduced also means that it is not possible for a fetus [of any developmental age] to experience pain" (2006, p. 911) Q.E.D.

Mellor and colleagues (2005) appear to commit a similar error, stating, in the opening sentence of their essay, "Whether the fetus can truly experience pain, at least in some way analogous to how adults emotionally *understand* pain, has been debated extensively over recent years" (2005, p. 456, emphasis added). Not surprisingly, Mellor et al. go on to claim that, "There are both a physiological and an

emotional or cognitive aspect to pain perception, and indeed a significant element of learning" (2005, p. 456), at which point, not surprisingly, they approvingly cite Derbyshire (1999).

How did Derbyshire (2006) and Mellor (2005) make such an apparently enormous conceptual mistake in this domain? How did they go from the raw feel *of* pain (an aversive experience that tends to result in avoidant behavior), to a cognitive *ascription* of some sort *to* this feel? Perhaps the answer can be found in Derbyshire's attempts to explain the origin of conscious experience more broadly, a developmental milestone which he considers to be a prerequisite to pain sentience. According to Derbyshire consciousness requires proper psychological *content*, and proper psychological content requires an appropriate postnatal environment: "It is also necessary to assume that conscious function can only emerge if the proper psychological content and environment has been provided" (Derbyshire, 2006, p. 911). But what, precisely, does he mean by proper 'content' here? He states, "Before infants can think about objects or events, or experience sensations and emotion, the contents of thought must have an independent existence in the mind. This is something that is achieved through continued brain development in conjunction with discoveries made in action and in patterns of mutual adjustment and interactions with caregivers" (2006, p. 911). What Derbyshire means by "an independent existence in mind" is unclear—does not just *any* mental act or event have "an independent existence in mind"? According to Derbyshire it seems not. What he *appears* to imply here, instead, is that such "independent existence" essentially involves "representational memory": "The development of representational memory, which allows infants to respond and to learn from stored information rather than respond to material directly available, may be considered a building block of conscious development" (Derbyshire, 2006, p. 911). He goes on to say that, "Representational memory begins to emerge as the frontal cortex develops between 2 and 4 months of age, supported by developments in the hippocampus that facilitate the formation, storage, and retrieval of memories" (2006, p. 911).

What is critical to appreciate is that Derbyshire appears to require of consciousness *simpliciter both* one's *thinking about* what almost everyone else calls the *contents* of consciousness *and* one's having the ability to perform certain ('representational') memory functions. Obviously, the ability to think about mental elements and to exemplify representational memory functions are later cognitive developmental milestones, so one who, like Derbyshire, requires these higher mental functions for *the very existence* of consciousness will, predictably, claim that consciousness, and hence pain sentience, does not appear on the scene until an appreciable time after birth.[7] In fact, according to Derbyshire's (1999) calculations, pain sentience in humans is reached at *approximately 1 year after birth* (although he does not want to rule out "the possibility of a rudimentary, or impoverished, awareness, at an earlier age," (1999, p. 27). It is, however, left wholly mysterious why representational memory would be required for one of the things that pain appears to do best, viz. act as a *constant reminder* that (in most cases) one's body is damaged.[8]

Derbyshire (relying heavily on Leventhal, 1984), in this way, *builds in* highly sophisticated cognitive capacities into the *very notion* of pain, then, lo and behold,

points out that fetuses could not possibly possess such psychological sophistication and, therefore, fetuses (and neonates, and infants until they are approximately one year of age) cannot feel pain. Derbyshire's confusion is elementary; except that he (and others that have appeared blindly to follow him, including the *JAMA* authors who approvingly cite him twice in this regard) does (do) not seem to be conscious of it. One wonders why Derbyshire does not just require an ability to do the calculus as an essential element of consciousness in which case, most of humanity would not be conscious. Clearly, neither consciousness, more broadly, nor pain, more narrowly, require either representational *memory or* the ability to perform metacognitive acts (such as thinking about elements of one's mentation) *even if* the *further* development of, or elaboration of, or structuring of human consciousness in the direction of maturity clearly *does* require one's achieving these mental milestones.[8] Whether consciousness requires any content at all (in the usual sense of 'content') is itself a disputed issue. But even assuming that it does, the required content need not be nearly as elaborate as Derbyshire imagines. Rather the content of one's consciousness might be simple *unpleasant experience* that in more extreme cases is also *awful* (but need not be), and that, in virtue of its unpleasant feel, *tends* to drive an organism away from its source (or result in one's inserting a barrier between an organism and the source of pain, or one's disabling or destroying the source).

Merker (2007), on the other hand, provides, in clear language, the traditional, sober-minded alternative to Derbyshire's view of consciousness, stating that, "the attribution of consciousness is not predicated upon any particular level or degree of complexity of the processes or contents that constitute the conscious state, but only upon whatever arrangement of those processes or contents makes experience itself possible. To the extent that any precept, simple or sophisticated, is experienced, it is conscious, and similarly for any feeling, even if vague, or any impulse to action, however inchoate" (Merker, 2007, p. 63). *The very idea* of a 'minimally conscious state' (Boly et al., 2004), for example—a severe hypokinetic neuropsychiatric disability widely recognized in the medical community, that bridges the initial part of the gap between states of unconsciousness and states of robust consciousness, depends on there being *levels* of consciousness some of which are barely suprathreshold. There is, after all, *something it is like* to be minimally conscious, just as there is something that it is like to be an echidna, a caiman, and a bat (Nagel, 1974).

Perhaps, therefore, a binary 'emotional' capacity comprised merely of pleasantness and unpleasantness is required for an experience's being a pain. If we mean by 'unpleasantness' an (aversive) experience that *ceteris paribus* translates into a tendency toward behavioral *avoidance* and by 'pleasantness' an experience that translates *ceteris paribus* into a tendency to behavioral *approach*, without building in any further 'emotional' components, then it might be appropriate, after all, to retain the term 'emotional' in one's definition of pain. However, judging from the richly textured emotional categories that have been recruited by contemporary writers on fetal pain such as Derbyshire, Mellor and his colleagues, and the *JAMA* authors, categories which have resulted in specious arguments for the early fetus' being *incapable* of feeling pain, I would recommend not including the term

'emotional' in any adequate, general definition of 'pain'. Finally, it merits stating that there is no good reason of which I am aware to link the very definition of 'pain' to tissue damage, whether actual or potential. Of course, most pain is, in fact, associated with actual or potential tissue damage, but some clearly is not (e.g., psychogenic bodily pain, or emotional pain).

Pain, then, is a variety of *unpleasant experience*.[9, 10] There is something aversive about pain, something that organisms tend to avoid, something—in more severe cases, but *only* in more severe cases—that is *awful*. Notice that I do not believe that pain is *essentially* awful. Some pains, at least when one focuses on them, or attends to them, are *merely* annoying or unpleasant or unwanted, much like an itch is annoying or unpleasant or unwanted. (Of course, some itches, too, can be *awful*.) But itches are not pains.[11] How do they differ? In at least two ways: by qualitative, raw feel and by their functions. Pains simply *feel different* than itches, and this difference in feeling is reflected in a difference in function insofar as pain has a unique role to play in our survival, driving us, often forcefully, (when we are functioning properly) *from* those circumstances that could result in our mutilation, maiming, or murder, or driving us to protect ourselves while still in those circumstances.

Clearly, *ceteris paribus* causing (a non-guilty) organism S pain is morally worse than refraining from causing S pain. And, of course, intentionally causing pain, or at least not relieving pain when one can (even if this pain is not intentionally caused), is what underwrites the practical link between fetal pain sentience and fetal surgery, experimentation, and abortion. If there is a good (sound, non-question-begging) argument for the conclusion that human fetuses of a certain developmental age can feel pain, and if there exist ways of relieving or preventing this pain that are not burdensome, not a serious danger to the mother's health, and are just, then it appears that abortionists would be obliged to provide unborn humans this pain relief while killing them.

But what if there is no such argument? What if, in fact, someone proposes a good argument for the *opposite* conclusion—an argument demonstrating that early unborn humans are in fact pain *insentient*? Well, how much better, if at all, is it to kill a pain *insentient* human *ceteris paribus* than one that is pain *sentient*? This question is importantly different than asking whether it is morally worse to cause pain while killing a (hereafter understood to be 'non-guilty') human than not to cause pain while killing a human. The answer to this *latter* question can be read off of the above proposed *ceteris paribus* statement. If *ceteris paribus*, *causing* someone S pain is morally worse than *not* causing S pain, it is clearly morally worse *ceteris paribus* to cause pain while killing a human than to kill a human without causing him to experience pain. The *former* question, however, says nothing about causing pain, but asks only whether killing a human that is pain sentient is *ceteris paribus* worse than killing one that is not, even if *neither* human experiences pain in the process of being killed.

Some children are born pain insentient, 'suffering' from 'Congenital Insensitivity to Pain' or 'CIP' (Manfredi, Bini, Cuccu et al., 1981). These children are, in virtue of having CIP, in many ways, *more vulnerable* than those children that are pain

sentient. When attacked, for example, they are not in a position to respond optimally in ways to fend off their attackers or to protect themselves. They are not, in other words, responsive to certain unpleasant aspects of assault that might allow them more adequately to defend themselves. They are, therefore, more likely to be mutilated, mauled, maimed, mangled, and murdered. They are also (like those with advanced leprosy) more likely to hurt themselves and not know it. Correlatively, one might argue that if the human fetus is pain insentient, and if pain (not mere lower central nervous system reflex withdrawal), even in utero, has *survival value*, then *ceteris paribus* one who intentionally kills the more vulnerable insentient unborn human, acts more viciously than one who intentionally kills unborn humans who are capable of feeling pain.

But *does feeling pain* (as opposed to the mere reflexive, spinal cord-mediated, defensive responses to noxious stimuli) have survival, or any other positive value in utero? Well, it would *if* the aversive stimulus perception amplifying effects of pain experience mobilize fetuses to evade or defend themselves against threats, or if these experiences facilitated one's protecting one's injured body part, or if these experiences somehow mediated changes in one's physiology (e.g., one's hormonal environment) that conduced to survival. Perhaps pain sentience results in greater evasive maneuvers or more vigorous attempts to neutralize threats or to protect one's injuries even if there is no *voluntary control* (of which, certainly, at least early unborn humans are incapable) over these responses, or perhaps it mediates a persistent change in physiology (e.g., involving elevations in stress or related hormones) that somehow conduces to healing or to vigilance regarding future threats or improves reaction time. In other words, in line with the former suggestion, possibly, pain sentience might in some way that is *disconnected* from voluntary action, augment adaptive responses to threats (whether defensive or evasive) or to damage from the consequences of tissue damage.

I have suggested elsewhere that it is reasonable to believe that developmentally primitive consciousness is what I call *disconnected consciousness*, i.e., disconnected from playing any role in the performance of voluntary action, and that such disconnected consciousness might be present outside of the normal fetal context (for example, in anencephalic neonates, unresponsive adults in hypokinetic states, or in those undergoing general anesthesia). (Howsepian, 2011) This disconnection is quite plausible in fetuses in light of the uncontroversial claim that, developmentally, consciousness temporally precedes voluntary control over one's actions (an achievement in control that likely occurs only after a significant amount of time in one's postnatal environment). Now, suppose that the fetus is physically harmed in utero, i.e., suppose that he suffers tissue damage of some sort to one of his limbs. Then suppose that at the time of this tissue damage, reflexively (at the spinal cord level) the fetus withdraws the injured limb (an evasive maneuver) *and* pushes away the source of damage with the uninjured limb (a defensive maneuver). Once the injury stimulus is withdrawn, suppose that the spinal cord level reflex actions subside, only to reanimate the fetus when the stimulus is reintroduced above a certain threshold. But now suppose that higher level 'reflexive responses' were in play, ones that were

mediated by higher brain centers involving persistent pain *experience*. Such experience would be expected to *persist* after the spinal cord mediated reflexive motor acts are performed *making present in experience* the injury that no longer mobilizes the spinal cord to participate in lower level reflexive movement. This injury persistently made present by consciousness might then, through higher level reflexes, sensitize and mobilize motor acts resulting in limb protection, for example, that would facilitate healing or prevent future injury.

When adults hurt a limb, they tend to hold it in a manner that tends to protect it, and this holding (at least in most cases) is not a matter of spinal cord reflexes. What I am suggesting is that, although this altered holding of one's limb by us might largely be due to voluntary motor acts, it is not implausible to imagine that such changes in limb position in unborn humans with even disconnected consciousness might be mediated, not by voluntary acts (of which unborn humans are incapable), but by higher order reflexes centrally involving persisting, present, pain experience. Not all reflexes, after all, are *spinal* reflexes. There are also cranial nerve reflexes and other subcortical reflexes mediated by the brain rather than by the spinal cord. If one is uncomfortable calling that to which I am referring a 'reflex', no harm would be done. One in that position may call it whatever one wishes, so long as the referent of the term picks out a set of involuntary motor acts in response to a noxious stimulus that is mediated by persisting (pain) experience. Of course, as succinctly pointed out by Saunders (1997), "The *absence* of reflex movement does not mean that pain has *not* been felt, any more than the *presence* of reflex movement proves *conscious perception* of a noxious stimulus" (p. 303, emphasis added).[12]

The above argument is speculative. I do not pretend to know or even have good reason to believe that pain has *in utero* survival value to fetuses in the manner specified. My above reflections were drawn from the modal well of mere (physical) possibility. They are meant for future reflection and for expanding our thinking about the range of possible roles that pain *might* play in the fetal economy (including a possible role in increasing the fetus's probability of survival).

There is, however, one line argument for how fetal pain has in utero survival value that is more to the point. In fact, it goes beyond fetal survival itself, for if it is sound, then fetal pain sentience conduces not only to *fetal* survival, but it, in some instances, also conduces to *maternal* survival. The line of argument relies simply on one of the primary reasons that the issue of fetal pain sentience is so contentious in the abortion arena, namely, that advising women who are seeking abortions that their unborn children are pain sentient is likely (based on maternal responses informed by empathy, caring, intersubjective attunement, compassion, and benevolence) to decrease the number of women who are willing to follow through with an abortion procedure. This would clearly conduce to the greater survival of human fetuses worldwide. And conveying to mothers that their unborn children are pain sentient will also, in some instances, conduce to maternal survival (specifically, in those instances in which certain women *would have* died as a result of an abortion, but in which they in fact survive the process of childbirth).[13] Fetal pain sentience, therefore, indirectly, i.e., in virtue of our suspecting or discovering that it exists, increases fetal survival by way of our communicating this suspicion or discovery to women

seeking abortion who then, in many instances, would refrain from going through with the abortion procedure.

There is at least one other line of argument concerning fetal sentience beside the two that we have already considered, one that has been discussed in various ways by multiple authors (Glover and Fisk, 1996; Saunders, 1997; McCullagh, 1997; Myers, 2006). Suppose that there is *radical*, even *ineliminable, uncertainty* concerning this issue of whether or when the human fetus is capable of feeling pain. A common, and prudent, response to such uncertainty is to say one of the things the Roman Catholic tradition has said about similar matters for quite a long time relating to abortion and personhood, viz. if one is uncertain whether unborn humans are persons, the most prudent moral course of action is to *refrain* from intentionally killing unborn humans, for if we intentionally kill them and we happen to be wrong about what unborn humans are, we would be committing seriously morally wrong acts, and it is best to avoid committing such acts.[14] Similarly, if one is uncertain whether unborn humans feel pain, the most prudent moral course of action is, if one insists on following through with such killings, *ceteris paribus* to avoid intentionally killing human fetuses in a manner likely to cause pain but, rather, to presume that pain can be experienced and to take reasonable measures—measures that acknowledge multiple competing factors, including distributive justice, maternal health, and burdensomeness—to safeguard the pain sentient fetus from exposure to pain.

10.2 Part II

After having reviewed dozens of studies concerning fetal sentience, the *JAMA* authors (2005) conclude that it is unlikely that unborn humans prior to approximately 30 weeks gestation can feel pain because, prior to that time, they would not have developed the requisite functional neurological architecture for pain sentience. The claim here at least appears distinctively different from Derbyshire's since, for Derbyshire,[15] the requisite functional *neurological* architecture might be in place, but the preparatory period of *extrauterine exposure and interaction* that provides what Derbyshire calls the (preconscious) 'contents' of consciousness might not yet have taken place. Specifically, according to the *JAMA* authors (2005), pain *requires* consciousness, consciousness *requires* a functional cerebral cortex, and pain processing *requires* functional thalamocortical (or corticothalamic) connections. Mellor et al., among others, concur, stating, "In brief, however, it is generally agreed that an integrated [nociceptive] pathway exists by 24–28 weeks of gestation and that it includes the critical cortico-thalamic connections deemed to be essential for the experience of pain" (Mellor et al., 2005, p. 456). Furthermore the *JAMA* authors (2005) claim that that electroencephalographic data "suggest the capacity for functional pain perception in preterm neonates probably does not exist before 29 or 30 weeks" (2005, p. 947). Sonfield (2005) correctly notes that the *JAMA* authors "determined that signs of activity in fetuses and premature babies often cited as evidence that they perceive pain sooner [than approximately 30 weeks gestation] are more likely to be reflex motions and hormonal responses" (Sonfield, 2005, p. 1).

The signs to which many are now pointing, of course, can be observed by way of 4D ultrasound technology images of in utero unborn humans that are quite realistic and, very early in postconception life, reflect apparent behavioral responsivity involving relatively complex behavioral sets. Savell (2007) importantly points out how these images have shifted the ground underneath the abortion debate in two important ways, first, by focusing on fetal *sentience* as opposed to fetal *viability* as setting the legal threshold for abortion regulation (as had, notoriously, been the standard set in *Roe v. Wade*) and, second, by thereby shifting the conceptualization of abortion itself from *pregnancy termination* to *feticide.*

In the course of their investigations, the *JAMA* (2005) authors (as do Mellor et al., 2005) clearly help themselves to analogies between the behaviors exhibited in the face of nociceptive stimulation of unborn humans prior to approximately 30 weeks and the behaviors exhibited by anencephalic children. In addition, these authors help themselves to analogies between the behaviors exhibited in the face of nociceptive stimulation of unborn humans prior to approximately 30 weeks and the behavioral responses of seriously neurologically disabled adults, for example, those adults in vegetative (or what I suggest are more appropriately termed 'hypokinetic') states (Howsepian, 2006), as well as those adults who are under (what is believed to be adequate) general anesthesia (Howsepian, 1994, 1996). Call anencephalic infants, those in other purported vegetative states, and those adults under general anesthesia, 'the inferred pain *insentient* known sample'. The general strategy of the *JAMA* (2005) authors' argument is something like this. Begin your inquiry with normal mature postnatal humans who we are certain (or at least as certain as we can be in light of 'other minds' concerns) are capable of feeling pain. Call this 'the inferred pain *sentient* known sample'. Examine their nervous systems. Compare fetal nervous systems with the nervous systems of the inferred pain sentient known sample. Then, attribute pain sentience *only* to those unborn humans who have nervous systems that are *relevantly similar* to the inferred pain sentient known sample. If fetuses whose nervous systems that are *not* relevantly similar to those organisms in the inferred pain sentient known sample *act like* organisms who *are* in the inferred pain sentient known sample, then this finding is explained *by analogy* to those in the inferred pain insentient known sample: they *also* are *not* pain sentient but, like those in the pain insentient pain sample, in various circumstances *act as if* they are pain sentient. We will call this the '*JAMA* strategy' (in spite of the obvious fact that this strategy is not only *not unique* to the *JAMA* authors, but is nearly ubiquitous in the fetal pain literature among those who deny pain sentience to any but late developmental age human fetuses).

There are multiple deep problems with this strategy. I will discuss only three. First, *the JAMA strategy presumes to know quite a lot about the neural substrate for consciousness, but this presumption is highly suspect*, to say the least. Simply put, *the neural basis of consciousness, including pain consciousness, is not known*. The neurological architecture and functional status that is *essential* to human consciousness is a vexed issue. This problem can be approached from at least two directions. First, we still have no reliable way of judging whether mature humans who *appear conscious* (for example, those in certain hypokinetic states) are *in fact*

conscious. Second, correlatively, we also have no reliable way of judging whether mature humans who appear *unconscious* (e.g., those under general anesthesia, or those judged to be in coma or in certain other hypokinetic states) are in fact *unconscious* (Alkire et al., 2008; Howsepian, 1994, 1996, 2006). These perspectives on (un)consciousness differ in subtle ways. In the first instance, one is attempting to detect *consciousness* when a suspicion of *consciousness* is present, while in the second instance, one is attempting to detect *un*consciousness when a suspicion of *un*consciousness is present.

More narrowly, the frequently relied upon claim by multiple authors in this discussion (primarily those who argue for fetal insentience except in late third trimester fetuses or infants) that a (properly structured and properly functional) *cerebral cortex* is required for human consciousness, is not only contested but arguably has been refuted by both empirical and more theoretical considerations. The *JAMA* authors (2005), for example, insist that a functional cerebral cortex is essential for consciousness. Others (e.g., Mellor et al., 2005; Rokyta, 2008; Lagercrantz and Changeux, 2009) concur. (Derbyshire (1999) opts, instead, for a functioning anterior cingulate cortex).[16] Mellor et al. (2005), for example, state,

> Several commentaries suggest that once the nociceptive pathway is complete the fetus may experience pain and that various behavioral and physiological responses may reveal fetal awareness or subjective consciousness of pain. For instance, the human fetus responds to intrahepatic needling (versus umbilical cord sampling) by moving away and with an increase in the levels of circulating stress hormones such as cortisol, corticotrophin releasing hormone (CRH), catecholamines, and beta-endorphins (hormonal responses that are routinely mounted in more mature human organisms in response to pain reports). These responses are independent of maternal responses. . .It is noteworthy, however, that these responses are elicited at the subcortical and brainstem level and do not require cortical input. Thus, they cannot be said to represent evidence for cortical awareness[17] (p. 457).

However, according to other voices in this discussion, including, McCullagh (1997),

> The dismissal of fetal withdrawal from noxious stimuli as 'only reflex' is a secondary inference that is naïve unless one can confidently exclude suffering. Independent verification of that exclusion requires comprehensive understanding of the structure of pain pathways in the developing nervous system. Accepted correlations between structure and function in this context, however, are unreliable (p. 302).

In fact, alternative, well-established central nervous system loci involved in consciousness in general and pain sentience in particular (as opposed to perceptions of specific pain qualities) *include* the entire thalamus and brain stem *or* merely the 'upper brainstem' *independent* of thalamocortical mechanisms (*excluding* the cerebral cortex altogether).[18] The primary sources for this alternative understanding of the neuroarchitecture of consciousness and pain sentience can be found *inter alia* in the important clinical observations of pediatric neurologist, D. Alan Shewmon, M.D., and colleagues (1999) and in the careful theoretical work of neuroscientist, Bjorn Merker (2007). Merker (2007) summarizes his position as follows,

> [A]n upper brain stem system organized for conscious function. . .maintains special connective relations with cortical territories implicated in attentional and conscious functions, but

> is not rendered nonfunctional in the absence of cortical input. This helps explain the purposive, goal-directed behavior exhibited by mammals after experimental decortications, as well as the evidence that children born without a cortex are conscious. Taken together these circumstances suggest that brainstem mechanisms are integral to the constitution of the conscious state, and that an adequate account of neural mechanisms of conscious function cannot be confined to the thalamocortical complex alone." (p. 63).

Correlatively, Shewmon et al. (1999) and Lewin (1980) supply compelling clinical examples of consciousness in hydranencephalic children (i.e., children, at least some of whom, clearly do not possess a functional cerebral cortex) and (as described by Professor John Lorber of Sheffield University) in an otherwise normally functioning university student with hydrocephaly resulting in a cerebral cortex that is approximately one millimeter thick (an estimated 45 times thinner than normal), respectively. Finally, damage to the thalamus of Karen Ann Quinlan, who, for over a decade lay in a Permanent Vegetative State, was shown to exhibit a relatively preserved cerebral cortex and a substantially damaged thalamus (Kinney et al., 1994).

Notice that the views of Merker and Shewmon et al., and the evidence they provide for these views do not rely at all on the 'specificity theory' of pain, i.e., a theory that locates pain sentience in some single brain location. They simply provide powerful reasons to think that consciousness does not *require* cerebral cortical function, even if it *normally* does in more mature organisms. In addition, multiple studies (including those by Brooks et al., 2005; Craig, 2003; Nandi, Aziz, Carter et al., 2003; and Nandi, Liu, Joint et al., 2002) demonstrate that *cortical* manipulations do not, for the most part, change pain perception in adult subjects while *thalamic* manipulations more consistently do.[19] Furthermore, Stephen G. Waxman (2000), in one of the most well-respected and longest lived neuroanatomy reference works (first published in 1945 as the first book in the 'Lange' series), clearly states that it is *the thalamus*, not the cerebral cortex, that is believed to be crucial for pain perception. Based on these considerations (and multiple others in the medical and scientific literature), there is very strong reason to believe both that the cerebral cortex is not essential to *pain sentience* in particular and that the cerebral cortex is not essential for *consciousness* in general.

Second, *sufficient conditions for pain sentience are often confused with necessary conditions for pain sentience*. This point is stated succinctly by McCullagh, "Two questions—whether the cortex is *normally* involved in the appreciation of pain and whether it is *necessary* for this—are regularly conflated" (1997, p. 302, emphasis added). The important point here is that *adult* human brain structures that are claimed to mediate, or to be involved in, or to generate consciousness—even if these structures actually *do* play a role in mediating or generating consciousness—need not also be the brain structures that mediate or generate consciousness in *unborn* humans. It is possible, of course, for consciousness in unborn humans to be mediated by *none* of those sufficient conditions for consciousness in adult humans. What would need to be established, in order to show otherwise, is that some or all of those conditions in adult human brains are also *necessary* for mediating or generating consciousness *in unborn human brains.* Unfortunately, not only

has this not been established, but we do not even know (as discussed above) those conditions that are *necessary* for mediating or generating consciousness in *adult* human brains. The claim of the *JAMA* authors that, "the presence of thalamocortical fibers is *necessary* for pain perception" (2005, p. 952, emphasis added), whether in fetuses, neonates, infants, children, adolescents, or adults is, therefore, pure fiction.[20] Similarly, although Derbyshire is correct when he says that, "Pain is suggested to arise with development of the necessary neurological. . .structures," (1999, p. 1), it is pure fantasy on his part to imagine that he actually knows, or even has a good idea, what these necessary neurological structures *are*.[21] The neural basis of consciousness in human organisms of any developmental age remains deeply mysterious.

Third, if unborn humans feel pain, the pain felt is likely to be more intense, not less, than the pain felt by older, more mature humans exposed to equivalent nociceptive stimuli. This is suggested by studies of neonatal pain neurobiology and behavior that have established pain hypersensitivity in early neonates (compared to more mature humans) in virtue of the immaturity of pain inhibiting neural mechanisms in younger neonates (see Fitzgerald, 1987; Fitzgerald, 2000).[22]

10.3 Part III

Perhaps the most common strategy in the fetal pain literature engaged in by those who manage to find pain sentience only in late-term fetuses or in infants is to begin with neurobiology and then work analogically from neurobiology (whether directly, or indirectly by way of psychology) to pain sentience. Nothing, however, requires that one proceed in this fashion. A preferable, time-honored alternative, as I see it, is to begin with typical behavioral responses to noxious stimuli and to argue, *also by analogy*, in the manner that one typically proceeds when arguing for the existence of 'other minds'. The 'problem of other minds' involves the question of how we can know that other individuals in the world exemplify mental states. How do we *know*, or more weakly but still helpfully, how is it that we can be *rationally justified* in believing that other human beings have thoughts, feelings, and other mental properties? The standard response to this question is based on an argument from analogy: insofar as I can know, or be rationally justified in believing, that *I* have mental states and that my mental states are associated with certain behavioral responses, and insofar as I notice that *you* exhibit behavioral responses that are similar to mine, this licenses the inference that you, too, have mental states similar to mine.[23, 24]

Arguments from analogy are, of course, *inductive* arguments and, therefore, their conclusions do not follow from the truth of their premises with the force of necessity. But, although desirable, no such tight connection between the premises and conclusion are needed. What *is* needed is *some good reason or other* to think that, like me, others have mental states. The analogy gives me this good reason. I might be wrong, of course. It might be the case that I have mental states with correlated behaviors but that others with similar correlated behaviors have no such mental states. I cannot be *certain* that others have mental states based on this kind of argument. All of this

is true, but not relevant. What is important at this level of inquiry is not *certainty*, not a *guarantee* that others have minds like I do, but *a good reason to believe* that others have mental states, something that raises the probability to even some modest degree for the conclusion that others have minds (or exemplify mental attributes, or are thinking, feeling, or perceiving things, or possess mental properties, or perceive or feel or think x-ly[25], or whatever your favorite way happens to be for referring to something's perceiving, feeling, or thinking), something to break the skeptical stalemate with which we are presented in virtue of our not having direct access to anyone else's mental life.

The raised probability in the case of a fetus is, arguably, something less than the raised probability in the case of adult humans for, arguably, the complexity of, for example, speech and affective behavioral outputs in adult humans is substantially greater than the behavioral outputs of human fetuses exposed to noxious stimuli. Still, there is an analogical edge provided by the behavioral similarity of human fetuses exposed to noxious stimuli and adult humans exposed to noxious stimuli who in fact report being in pain. Why, then, can we not simply infer, from analogy, that any fetus that exhibits pain behavior (such as withdrawal, grimacing, crying with appropriate changes in heart rate or blood pressure) in response to a noxious stimulus is, like us when we are exposed to noxious stimuli, likely in pain? Or, more weakly, why cannot we at least *begin* our examination of the question of fetal pain sentience with *pain behavior*, rather than from the starting point of *functional neuroanatomy* and other aspects of neurobiology. Having a *neurological starting point* tends to drive the inquiry in a direction that, first and foremost, makes relatively *mature nervous system development* the standard for sanctioning an inference to fetal pain sentience. On the other hand, having a *pain behavior starting point* tends to drive the inquiry in a direction that, first and foremost, makes *similarities in behavior* the standard for sanctioning such inferences. Both strategies have their benefits and their moral and medical risks. The former strategy risks treating as pain *insentient* humans who are pain *sentient*; and the latter strategy risks treating as pain *sentient* humans who are pain *insentient*.

The primary and predictable objection to the proposed strategy (to be discussed below) is, interestingly, itself an objection based on analogy, but an objection based on analogy that, I believe, can be defeated insofar it is an objection based on two fundamental errors that have already been introduced. *First*, the objection is based on the mistaken presumption that consciousness of any sort, including consciousness of pain, is incompatible with conditions such as anencephaly, being *adequately* generally anesthetized (as opposed to being *inadequately* general anesthetized and, thereby, being prone to 'awareness episodes' under anesthesia), being in comatose, vegetative, or other hypokinetic states, or with any condition in which one is missing a functional cerebral cortex (e.g., hydranencephaly).[26] *Second*, it is based on a confusion between sufficient and necessary conditions. Clearly, the entire neuroanatomy and neurophysiology of normal adult humans exposed to noxious stimuli is *sufficient* for pain sentience, but this does not imply that it is also *necessary*. Insofar as we have no clear idea concerning the neural correlates of either consciousness or unconsciousness, we also have no clear idea concerning either which

specific aspects of normal adult human neurology (i.e., which *proper subset* of neural circuitry) are (is) *sufficient* for pain sentience or which aspects of normal adult human neurology are *necessary* for pain sentience. In light of our current epistemic position, how then ought we to proceed?

Consider the following proposal: in order for us to be justified in believing that a human fetus F, at a certain stage of development, is pain sentient, F's nervous system must be structured in such a way that there is an unbroken functional neural link between nociceptive receptors and some brain region or other that it is reasonable to believe plays a significant role in consciousness, more broadly, or pain experience, more narrowly.[27] Without any such unbroken (except, of course, by synaptic clefts) functional link, let us agree, there cannot be pain sentience (understood here as pain sentience *of peripheral origin*, leaving open the question whether there might be pain sentience of *central* origin in the absence of peripheral nociceptive stimulation). As long as such a functional link exists, if a noxious stimulus results in pain behavior in F that is relevantly similar to normal adult human pain behavior, then F is at least more likely than not to be pain sentient and, therefore, F ought to be treated as if F is pain sentient. The functional neural circuitry in such cases (or some proper subset of this functional circuitry) could be rationally believed to be at least *sufficient* for pain sentience, leaving open the question of whether such circuitry is also *necessary* for pain sentience.

Although many psychologists and psychiatrists have undertaken fruitful research programs and have found novel clinical applications for ideas that depend on making certain kinds of inferences (including analogical inferences) to other minds (viz. those involving 'mentalization' and 'theory of mind'), some philosophers have not been content with analogical arguments for the existence of other minds, instead seeking stronger, deductive justification for the existence of others' mental states. I know of no such arguments that are not open to skeptical objections—objections that result in these arguments' not being convincing to everyone.[28] There are clearly, for example, empirical challenges to the analogical argument that one cannot easily deflect. There are, for example, apparently emotional behavioral displays in adult humans which, based on inquiries with those who exhibit such displays, are devoid of the emotional experience that typically accompanies such behaviors. Certain strokes, for example, can result in affective displays characterized by weeping and wailing or by laughing (commonly referred to as 'pseudobulbar affect' or 'emotional incontinence') that are not accompanied by sadness (or some related negative emotion) or happiness (or some related positive emotion), respectively. Nevertheless, the vast majority of the time, when person S is weeping and wailing, S is sad, and when S is smiling and laughing S is happy.

Similar considerations apply in the case of the fetus. If a fetus displays pain behavior following noxious stimulation, and if that fetus has the functional neural substrate that could, given all we know, support pain sentience, then it is reasonable to infer that the fetus is pain sentient and, in light of this reasonable inference, unless this is overly burdensome, unjust, or seriously harmful to the mother, to treat that fetus as if he or she is pain sentient. In the estimation of the Commission of Inquiry into Fetal Sentience (1996), a human fetus can be plausibly believed to be

pain sentient at 5 weeks postconception. It has been known since the 1960's, for example, that human fetuses respond to trigeminal stimulation as early as 7 weeks gestation (Humphrey, 1964). And it is widely agreed that some spinal cord (afferent) projections from fetal skin free nerve endings (nociceptors) reach the thalamus at 5 weeks postconception.[29] In light of this data, unless countervailing data declares itself, it is rational, and safe, to believe, and act on the belief, respectively, that unborn humans are capable of feeling pain by the latter part of the first trimester of pregnancy.[30]

It is, therefore, *irrelevant* that temporary thalamo*cortical* connections are believed to begin to form at approximately 17 weeks and that they become established at 26 weeks (as cited by Glover and Fisk, 1996), or that thalamic nuclei approach *maturity* at approximately 12 weeks, or whether or not 'subplate' neurons—neurons comprising a transient fetal brain structure that is constituted by thalamic afferent fibers on their way to the cortical plate, about which much has been written (see, for example, Lowery et al., 2007)—play any role in pain perception, or that thalamic afferents reach the subplate zone at 20–22 weeks (*JAMA* authors, 2005), or that somatosensory evoked potentials have distinct, constant components at 29 weeks (*JAMA* authors, 2005). None of this is relevant in light of all that we currently have very good reason to believe, viz. that *neither* a mature thalamus *nor* a cerebral cortex are necessary for consciousness or pain sentience *in fetuses*, just as *the cortex appears not to be necessary for consciousness or pain sentience in older children or adults.* Similarly, given all that we currently know, neither fetal hormonal responses (which some suggest begin by 23 weeks gestation) nor Doppler blood flow redistribution to the brain (which some suggest begin by 18 weeks gestation), nor any other proposed biological indices of pain sentience that have been proposed, are relevant to this discussion. What *is* relevant is some functional connection or other from peripheral nociceptors to somewhere or other in the fetal brain that is currently a reasonable candidate for either playing a significant role in consciousness generally or pain sentience, more narrowly, *and* appropriate behavioral responses to noxious stimuli.

But what about the important work on feto-placental-generated endogenous neuroinhibitors (such as adenosine and the neuroactive steroids, pregnenolone and allopregnanolone as, for example, expounded upon by Mellor et al., 2005) that are believed to suppress fetal behavior and cortical activity *even if* the proper cortical neuroarchitectural structure has developed? These compounds are hypothesized to promote sleep in utero, thereby contributing to the suppression of fetal awareness. Certainly a sleeping fetus could not possibly feel pain, could it? Well, Mellor et al. acknowledge that their "observations demonstrate that sleep, or unconsciousness, is the dominant fetal state for at least 95% of the time" (2005, pp. 457–458). They then go on to state that, "The obvious and critical question is what state late-gestation fetuses are in during the 5% of the time that they are apparently *not* in REM [Rapid Eye Movement] or NREM [Non-Rapid Eye Movement] sleep?" (2005, p. 458, emphasis added). Mellor and colleagues' answer is that fetuses are, at those times of 'wakefulness', in a "transition phase between sleep states, a state which in the newborn is called indeterminate sleep" (2005, p. 459). 'Wakefulness' in this sense

(as the term 'wakefulness' is used in discussions of chronic hypokinetic states, such as the 'Persistent Vegetative State') is not the same as "[f]ull arousal from sleep" or "waking up" (p. 459) which, according to Mellor et al., is "a caudal-rostral brain process which originates in the ascending reticular activating system of the brainstem, spreads to the thalamus, *and finally to the cortex*" (p. 459, emphasis added). This ongoing commitment to an essential role for the cerebral cortex is central to Mellor and colleagues' hypothesis concerning fetal and neonatal consciousness and finds its way into chains of inferences that can be confusing. For example, they go on to say that, "Importantly, however, arousal can also occur without cortical activation and waking; this is termed sleep-arousal. In the infant, sleep-arousal without waking is common" (p. 459). The presumption here is that arousal without cortical activation *must* be an aspect of something like a *sleep* state (hence, 'sleep-arousal'), because 'full arousal from sleep' (i.e., 'waking up') *requires consciousness and consciousness requires a functional cortex*.

Of course, even if the fetus were in either REM or NREM sleep at every moment of his *ordinary* intrauterine existence, this does not imply that the fetus is pain insentient *simpliciter*, for some aspects of intrauterine life might be *extraordinary* in virtue of being marked by especially violent actions taken against the fetus. Being slashed across the face and eyes by a scalpel while asleep in utero, for example, is one extraordinary event that might occur, either unintentionally during fetal surgery, or intentionally during an abortion. Might this cause the fetus to 'wake up'? Ever the scientists, Mellor and colleagues (2005) state that, "This question [concerning the possibility of pain experience as a result of extreme fetal violence] has not been directly tested" (p. 460). Although Mellor and his colleagues go on to discuss fetal responses to hypoxia and vibroacoustic stimuli, they have no experimental data to rely upon when faced with queries concerning whether sleeping fetuses of any intrauterine age might respond if they were slashed or chemically burned or twisted or crushed or broken into pieces. It is very difficult for Mellor and his colleagues to say whether it is reasonable to believe that slashing, burning, twisting, crushing, or breaking into pieces might awaken a sleeping fetus. Perhaps one of the most illuminating probes regarding whether scientists such as Mellor and his colleagues are at least *suspicious* that extreme violence to sleeping fetuses might awaken them and cause pain is querying these scientists concerning whether this 'question that has *not* been directly tested' *should* be tested, and if it should, to ask whether these scientists would participate in such direct testing by being the ones who slash the face and eyes, burn the skin, twist off the head and limbs, crush the neck and head, and break the sleeping fetuses into pieces, to see whether they then 'wake up' and, at some time or other during this vivisection, respond as if they are in pain.

10.4 Part IV

Fetal pain sentience has relevance for how those whose business it is to kill unborn humans ought to go about their business. It also has relevance for pregnant women considering abortion, and for legislation, or simply best ethical practice in the

absence of legislation, regarding what women should be told by abortionists prior to these killings, during the 'informed consent' process. Making appropriate adjustments to how abortion is carried out, given that, currently, the law of the land continues to permit it, with the aim of minimizing fetal pain, constitutes a humane undertaking. Reflecting carefully on fetal pain sentience transforms the discussion concerning what the human fetus *is* from a relatively abstract, 'experience-distant' matter that involves the fetus's ontological structure (specifically, questions concerning whether the human fetus is or is not a human *person*) to a relatively more concrete, immediate, 'experience-near'[31] matter that involves fetal *psychology*. In the process, the fetus is transformed from an *object* of *metaphysical* inquiry into a *psychological* being, a *subject*, with whom we can enter into *intersubjective relations*. This is clearly a move in the right direction—humanizing our relationships with some of the most vulnerable among us who continue, relentlessly, to be dehumanized. It is, apparently, not uncommon for women (as noted by McCullagh, 1997) to "seek assurances that fetal pain will not occur" (p.302) during the abortion process. Destroying one's unborn child would be at least a little easier if it were believed to be painless. Conveying uncertainty to mothers seeking abortions regarding fetal pain sentience would be predicted to make following through with this course of action somewhat more difficult. And, predictably, conveying to mothers seeking abortions that there are good reasons to believe that one's unborn child is in fact pain sentient, in the face of those abortion procedures likely to cause pain, might, for some, prove to be an insurmountable barrier to pursuing this course of action at all, for those who do not wish to cause their children also to suffer in the process of having them killed, and for those whose ultimate aim is compassion and love for all sentient beings.

Notes

1. 'Whether or when,' because some commentators (e.g., Debyshire, 2006) deny that humans can feel pain at *any* time prior to and for a considerable time *after* birth, because they are not, at those times, in the relevant sense, *conscious*. In vivid contrast, Shewmon (1988) points out both the striking behavioral similarities noted between normal and *decerebrate* neonates and the "*traditional* (usually unspoken) *assumption*" that *normal* neonates, especially if premature, although awake, are not conscious "because of their relative lack of cortical function." (p. 14, emphasis added).
2. I will, for the remainder of the essay, for purposes of ease of expression, use the term 'fetus' and its cognates to refer to an 'unborn human' at any stage of his or her (intrauterine) development.
3. Legislation has been passed recently in several U.S. states that requires abortion providers to alert women seeking abortions, as part of the informed consent process that, depending on developmental age, their unborn children have the capacity to experience pain. More recently, in 2010, the state of Nebraska passed the historic 'Pain-Capable Unborn Child Protection Act' which limits abortion, under ordinary circumstances, only to fetuses under 20 weeks based on fetal pain sentience considerations.
4. Clearly, what Lowery and colleagues (2007) mean (or *should* mean) here is that this definition of 'pain' is the one that is most commonly accepted *by clinicians and scientists* who specialize in pain management or in pain research, respectively. It is clearly *not* the most commonly

accepted way of understanding what pain is by philosophers, who prefer conceptualizations of pain that involve notions such as 'awfulness', 'privacy', 'qualia', 'incorrigibility', 'raw feels', and the like. See, for example, Kaufman (1985), and Fiser (1986).

5. I will refer to Lee and colleagues (2005), who authored the very important article on fetal pain in one of the world's most prestigious and influential medical journals, the *Journal of the American Medical Association* (*JAMA*), as 'the *JAMA* authors' (2005).
6. As, for example, discussed by psychoanalysts, psychologists, psychiatrists, and others who ascribe to a wide range of unconscious mental processes in humans.
7. The process by which consciousness develops, to which Derbyshire subscribes, involves a relatively extensive preparatory period during which there is a rich elaboration of preconscious mental elements, including preconscious pains, it seems, or preconscious elements that, counterfactually, *would* be, or *result in*, pains *if conscious*.
8. As succinctly noted by The All Party Parliamentary Pro-Life Group (1996), lacking the cognitive capacity to communicate or remember pain precludes pain *reports*, but not pain *experience* itself.
9. Even this is not uncontroversial. Noren (1974) argues that not all pain is unpleasant and that not all pain is avoided. (The latter conjunct is certainly true, and is consistent with my position. I claim only that pain *tends* to be avoided, not that it always is.) He gives multiple purported counterexamples to buttress his dual claim that not all pain is unpleasant and that not all pain is avoided (including the very existence of *masochists*), none of which, I believe, succeed. (Masochists, for example, invite the infliction of pain not because pain is *not* unpleasant, but precisely because it *is*.)
10. A similar view is defended by Benatar and Benatar (2001)—although they propose an analysis of pain along the *quantitative* axis of 'severity' as opposed to its *qualitative* features—who insist (incorrectly, in my view) that pain must be conscious, and claim (again incorrectly, in my view) that "pain is by definition worse than non-painful unpleasant feelings" (p. 59). Some itches and some tickles, for example, are clearly more unpleasant than some pains.
11. Other unpleasant experiences that are not pains and that can be awful include tickles, relatively extreme temperature changes, and having one's limbs fixed in awkward positions. None of these experiences, however, share either the raw phenomenology of pain or pain's functional role.
12. Also, cf. Glover and Fisk (1996), "From 14 weeks most of the body responds to touch by moving away, but this is probably a subcortical reflex response" (p. 796). Consistent with this, the All Party Parliamentary Pro-Life Group states that, "A reflex response, in its simplest form, is a movement following a stimulus: it is an automatic reaction" (1996, p. 8), adding that the development of reflex movement (that depends on functional efferent connections to muscle) in fetuses likely develops *after* sensory nerve endings make their afferent connections in the brain, "suggesting that it is more likely for the fetus to experience pain before it has the capacity to move" (1996, p. 9).
13. This claim about fetal pain sentience's role in maternal survival is framed, counterfactually, as its conducing to the survival of certain *specific* women seeking abortions. It might also conduce to the survival of a *greater proportion* of pregnant women either overall or in certain locales or among certain cohorts or at certain times, depending on what the differential mortality rates of abortion versus childbirth happen to be overall, or at those locales, or among those cohorts, or at those times.
14. See the Sacred Congregation for the Doctrine of the Faith's 'Declaration on Procured Abortion' (1974).
15. Derbyshire makes quite clear that he does not endorse a 'specificity theory' of pain, i.e., a theory that attempts to locate some central brain region that subserves pain experience. He writes, "The basic failure of medical techniques based on specificity theory has led to the widespread abandonment of ideas based on a specific pain centre and led instead to the suggestion that there is a widespread pain system involving many different neural structures" (Derbyshire, 1999, p. 7). For Derbyshire, therefore, the importance of the cerebral cortex is not that it is the 'place in the brain' in which pain is experienced, for, he holds, there *is* no such place.

Rather, the cerebral cortex is, for him, a necessary structure involved in *consciousness* and it is *consciousness* of one's postnatal world that provides the essential cognitive ingredients for pain sentience. (Additionally, and very importantly, Derbyshire readily acknowledges that, "[T]here is surprisingly little consensus regarding the involvement of the cerebral cortex in pain processing" (1999, p. 9)). One might, therefore, have all the essential *neurological* hardware in place, but still not be pain sentient if the proper *psychology* is not delivered by that hardware's (or its software's) proper interface with the world. For this reason, for Derbyshire, postnatal exposure to the world, including appropriate interactions with linguistically competent caregivers, is essential for pain sentience. (He is, therefore, committed to the highly counterintuitive view that feral children, or even adults, for example, would be pain insentient. It is not clear what Derbyshire would say about a brute animal's experience of pain since, of course, brutes would not be expected to require linguistically adorned consciousness in order to experience pain.) The *JAMA* authors (2005), however, at least appear to rely more on the proper neurology's being in place independent of any reliance on proper psychology, insofar as they endorse pain sentience in utero (prior to the kind of interface with the extrauterine world, and the psychological structure that this provides, that Derbyshire requires) but only for late-term fetuses.

16. And, according to Benatar and Benatar, "pain seems impossible prior to the formation, at 18 weeks gestation, of synaptic connections in the cortical plate," i.e., the precursor to the cerebral cortex" (2001, p. 64). Eventually, based on this cortical requirement for pain sentience, Benatar and Benatar conclude that, "It is certainly the case that the perception of pain as a result of external noxious stimuli would not be possible until a *complete* neuronal connection is established from peripheral nociceptors to cerebral cortex (via spinal cord, brain stem and thalamus). This occurs by about 28–30 weeks gestation" (2001, p. 64, emphasis added). They later go on, appropriately, to distinguish wakefulness (a state of arousal) from consciousness, but then mistakenly conclude that, "While consciousness is supervenient on the function of the cortex, it is only possible in the wakeful state" (2001, p. 65). Ignoring their claim concerning supervenience, as opposed to some other relation between consciousness and cortex, *lucid dreamers* clearly provide counterexamples to Benatar and Benatar's claim that consciousness requires wakefulness.
17. Of course what Mellor et al. (2005) *say* here is literally true: without *cortical* inputs there can be no *cortical* awareness. What they *mean*, however, is that, in virtue of their belief that the cerebral cortex is essential for awareness, and hence pain perception, there can be no *other*, i.e., *non*-cortical, awareness or pain perception either.
18. That pain results from certain thalamic lesions has long been recognized. This is not to say that others have not found that some cortical manipulations *can* result in pain perception and, hence, that such manipulations are sufficient for pain perception in intact organisms. See, for example, the very early work of Penfield and Bolder (1937). This finding, however, does not imply that the cerebral cortex is *necessary* for pain sentience. Penfield (1952) later notes (as quoted by Merker, 2007), that "*the highest integrative functions of the brain are not completed at the cortical level, but in an upper brainstem system of central convergence supplying the key mechanism of consciousness"* (Merker, 2007, p. 64). It is important to note that what Penfield and Jasper (1954) call the 'upper brainstem' includes the midbrain reticular formation and its connections with the midline, intralaminar, and reticular thalamic nuclei.
19. Curiously, the *JAMA* authors' reliance on electroencephalography (EEG) for establishing whether or not existing thalamocortical fibers are *functional* is, on their own terms, misplaced, insofar as they readily admit that "no electroencephalographic 'pain pattern' exists. . .EEG activity alone does not prove functionality, because neonates with anencephaly who lack functional neural tissue above the brainstem may still have EEG activity" (2005, p. 950).
20. According to Derbyshire, "[A] 'neuromatrix' of regions, incorporating structures such as the anterior cingulate cortex which shows a plasticity with learning and development, is proposed as necessary for the experience of pain" (1999, p. 15).

21. Benatar and Benatar (2001), in a very commonsense sort of way, elegantly underscore this point by noting an illuminating analogy between children and fetuses in this regard, stating, "Children, after all, sometimes react to pain more vigorously than adults. Although it is hard to say whether it is simply the reaction that is greater or also the qualitative feel of the experience, the latter possibility cannot be discounted" (p. 75).
22. The traditional 'problem of other minds' as discussed in the philosophical literature has intimate connections with what is, in the current clinical literature, referred to as the process of 'mentalization' (Fonagy, Gergely, Jurist and Target, 2002) on the one hand, viz. the ability to understand, perceive, or interpret others' and one's own mental states based on inferences drawn from observable behaviors (with a richly textured appeal to the affect-laden social and interpersonal grid in which such states occur, culminating not only in important social or interpersonal growth, but also in the development of one's sense of self), as well as with what is referred to as 'theory of mind' (Baron-Cohen, 1991), on the other (of which theories of mentalization are rich extensions and elaborations), viz. one's ability to attribute mental states to others and to understand that these mental states are distinct from one's own.
23. A similar illuminating discussion of the problem of other minds applied to the discussion concerning fetal pain can be found in Benatar and Benatar (2001, pp. 61 ff.) who rely on a combination of appropriate pain behavior in "the presence of the neurological anatomy and physiology required for bringing about pain" (p. 61) as a foundation from which to infer fetal pain sentience (what Benatar and Benatar call "the problem of fetal minds" (p. 75)). Benatar and Benatar (2001), however, appear to overreach here. Because it is *not known* what anatomy and physiology is *required* for bringing about pain, something like a 'reasonable candidate' neuroanatomy and neurophysiology standard is more plausible in this domain.
24. For a spirited defense of 'adverbialism' regarding visual perception, see Tye (1984).
25. The claims here are that (1) there is reason to believe that those who are diagnosed to be, for example, in vegetative states are often *mis*diagnosed (in fact, 37% in the study by Andrews and colleagues, 1996) *and* that even the 'proper' diagnosis of vegetative state is compatible with some level of consciousness (unless, of course, the presence of consciousness, no matter how fleeting and minimal, and undetected or undetectable, is itself taken to be *sufficient* for one's *not* being in a vegetative state) (Howsepian, 1994, 1996); (2) there is reason to believe that some patients under general anesthesia who are 'properly anesthetized', i.e., who do not have 'awareness episodes' while anesthetized for purposes of surgery (during which they are fully awake and alert, but unresponsive, like a 'locked-in' patient would be), are in fact *conscious* (as discussed by Alkire and colleagues, 2008) albeit *unresponsive and amnestic* for their experiences (as revealed by data from research involving the 'isolated forearm' technique under anesthesia that shows that patients can be *aware and responsive* during surgical procedures *in spite of bispectral values that suggest that they are unconscious*); and (3) properly diagnosed anencephaly, like properly diagnosed hydranencephaly, as discussed by Shewmon (1999), is compatible with the presence of consciousness (Shewmon, 1988; Shewmon et al., 1989; Howsepian, 2011).
26. Putting aside, for now, the contentious issue of what, precisely, should count as a *brain*. For some preliminary reflections on this issue, see Howsepian (2008, and 2011).
27. See, for example, P.F. Strawson's now classic treatise, *Individuals*, (1959, chapter 3); and Alvin Plantinga's seminal *God and Other Minds* (1967) for intense critical scrutiny of the analogical argument.
28. This point is even acknowledged by the most ardent of fetal sentience skeptics, including Derbyshire (2006), who sets "the lower limit for the experience of pain at 7 weeks' gestation" (p. 909). The fact that the thalamus is immature at this time, as Derbyshire also points out, in virtue of not being layered as it later becomes, is irrelevant to this discussion insofar as it is unknown whether such layering is *necessary* for pain sentience.
29. This conclusion is consistent with The All Party Parliamentary Pro-Life Group's opinion (1996)—an opinion based on a methodology (viz. hormonal and behavioral responses to nociceptive stimuli, the intensity and nature of the stimuli, and nervous system development)

relevantly similar to the one employed here: "The balance of evidence at the present time indicated that these [anatomical] structures [subserving the appreciation of pain] are present and functional before the 10th week of intrauterine life" (1996, p. 6). It goes on to state that, "the practice in veterinary and human medicine is to presume that the subject may be able to feel pain from any given procedure, unless this can be excluded with reasonable confidence" (1996, p. 7), adding that, "In Australia this includes the fetus of any given species" (p. 7) that is used in animal experimentation. Who, after all, would accept the claim that the withdrawal of a dog's leg that a researcher immersed in boiling water is 'mere reflex'? (p. 9).

30. I borrow this terminology from Kohut (1977).

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