

# What’s wrong with the minimal conception of innateness in cognitive science?

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forthcoming in *Synthese*

## 1 Introduction

One of the classic debates in cognitive science is between nativist and empiricist explanations of the development of psychological capacities. In principle, the debates is empirically driven. However, in practice nativist hypotheses have also been challenged for offering explanations that rely on a purportedly ill-defined—and even unscientific— notion of innateness.<sup>1</sup> Indeed, few notions in the field enjoy as stubborn a reputation for resisting philosophical illumination. If queried for a description, the temptation lingers to simply rehearse the platitude that what is innate is “not learned”. However, on its own this *minimal conception* of innateness is typically dismissed as inadequate if our goal is greater clarity regarding the form of nativist hypotheses about psychological development.

In what follows I defend the minimal conception. More specifically, I defend four claims. First, the minimal conception is crucial to understanding the nativism-empiricism debate, properly characterized (Cowie, 1999; Margolis and Laurence, 2013). Second, various objections to the minimal conception—that it risks overgeneralization, lacks an account of learning, frustrates genuine explanations of psychological development, and fails to unify different notions of innateness across the life sciences—are less potent than they appear. Third, the minimal conception suffers from none of the weaknesses of its descendent *primitivism*, the prominent view that innate capacities are those not acquired via psychological processes in development (Cowie, 1999; Samuels, 2002). And fourth, my defense of the minimal conception undermines attempts to identify innateness as a natural kind (Khalidi, 2016; Samuels, 2007). So in short, we have little reason to reject, and good reason to simply accept, the minimal conception of innateness in cognitive science.

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<sup>1</sup>See for example: Cowie (1999); Griffiths (2002); Linnquist (2018); Mameli and Bateson (2006); Samuels (2007).

The paper proceeds as follows. In Section 2, I defend the relevance of the minimal conception to characterizing the nativism-empiricism debate. In Section 3, I reply to several extant objections to the notion. In Section 4, I compare and contrast the minimal conception with primitivism. In Section 5, I discuss the minimal conception and natural kinds. Section 6 concludes the paper.

## 2 The Minimal Conception and the Nativism-Empiricism Debate

At the outset we should distinguish between two issues. One concerns whether our commonsense notion of innateness, in some form, should feature in the theories of cognitive science. The other concerns whether innateness, as a quasi-technical notion employed within a particular scientific practice, picks out a theoretically important property. Of course, the notion of innateness used in cognitive science is plausibly derivative of our commonsense understanding, so these issues are not unrelated. However, they can be distinguished, and while some conceptual critiques of innateness in the sciences focus on the former issue (Linquist, 2018), my focus is the latter (Samuels, 2004).<sup>2</sup> The minimal conception in fact identifies a property that is crucial for the proper characterization of the nativism-empiricism debate, as I argue in this section.

### 2.1 What is at Stake in the Debate

In order to assess the import of the minimal conception we first need an answer to the following question: what is the nativism-empiricism debate really *about*? One answer is that at root the disagreement concerns whether there are innate psychological capacities at all. For example, Stich (1975, p.1) writes:

Some... allege that human beings have innate knowledge or innate ideas. Others deny it. But what is it to have innate knowledge or an innate idea? There is a pattern running through much of the debate in this area. Advocates of the doctrines of innate ideas and innate knowledge commonly take the notion of *innateness* itself to be unproblematic. They explain it with a few near synonyms, “inborn” or “unlearned”, or with a metaphor or an allegory, and leave it at that. The doctrine’s opponents often begin by puzzling over just what the doctrine could possibly *mean*.

This answer places a clear conceptual burden on the nativist. However, as Margolis and Laurence (2013, p.695) point out in reply to Stich, the burden is actually shared:

Empiricists may not accept innate knowledge or ideas, and may instead opt for innate processes, mechanisms, dispositions, or biases. But *something* has to explain why human beings come to

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<sup>2</sup>For this reason I set aside experimental work on our folk conception(s) of innateness (Griffiths et al., 2009; Knobe and Samuels, 2013; Linquist et al., 2011).

learn things about the world around them and rocks don't. This something is typically taken to be innate. . . For this reason, the very existence of innate traits can't be what divides nativists and empiricists, nor can it be the notion of innateness.

Then what does divide them? At heart the debate concerns not whether psychological capacities are "learned or innate", but rather the character of the innately determined learning systems in development that underwrite the acquisition of particular psychological capacities (Cowie, 1999, p.30). This character can come in one of two general forms: either the learning systems are *domain-general*, in that they can apply across psychological domains (e.g. the system that allows us to acquire the capacity for mindreading is the same as for acquiring natural language) or *domain-specific*, in that they are tailored for specific psychological domains (e.g. mindreading and language acquisition are subserved by distinct faculties).<sup>3</sup> So what empiricists and nativists disagree about is the relative ubiquity of domain-specific vs domain-general learning systems in the explanation of psychological development (Cowie, 1999; Margolis and Laurence, 2013). Following Margolis and Laurence (2013, p.696-697), I will refer to the distribution of these learning systems as the *acquisition base*.<sup>4</sup> An empiricist acquisition base posits a few domain-general systems, limiting the role for domain-general ones, while the nativist acquisition base posits many domain-specific ones with a more limited role for domain-general systems. As Margolis and Laurence acknowledge, these contrasting acquisition bases should really be seen as ends on a continuum, which different researchers use as points of departure as they move (ideally) towards greater explanatory convergence.<sup>5</sup>

This second answer is well illustrated by two examples. The first is *poverty of the stimulus* (POS) arguments for nativism. Although these arguments are notorious in cognitive science—and also notoriously misunderstood (Laurence and Margolis, 2001; Crain and Pietroski, 2001)—generally they go as follows: first, start with empirical claims about the information in the environment available to the learner early in (human) development. Next, illustrate why appeal to domain-general learning systems, provided solely with this information, cannot explain how the target psychological capacity is acquired in the time-frame allotted by development. Something must pick up the explanatory slack, and account for how the learner is able to acquire the capacity within these developmental constraints. So one concludes that a more domain-specific learning system must be posited.

POS arguments feature prominently in defenses of nativist hypotheses concerning the acquisition of natural languages (Chomsky, 1975; Crain, 1991). For example, following Lidz et al. (2003) consider the

<sup>3</sup> Note that in recognizing both kinds of learning systems are innate, I do not presume an intrinsic connection between innateness and domain-specificity (Khalidi, 2001).

<sup>4</sup> Notably, this way of understanding the debate does not rule out the possibility that domain-specific knowledge, or concepts, may form part of the acquisition base. For discussion see Margolis and Laurence (2013, p.712-715).

<sup>5</sup> Of course, matters may also depend on the psychological domains in question. For example, one can hold that mindreading depends on domain-general statistical learning systems, and support this empiricist hypothesis by appeal to domain-specific learning mechanisms in perception (see e.g. Ruffman, 2014).

grammatical structure of noun phrases (NP) like (1):

1. The red ball.

What is clear is that (1) consists of a determiner, adjective, and noun, but there are at least two ways of analyzing the structure of the sentence:

1a.  $[[The]_{det}[red]_{adj}[ball]_N]_{NP}$

1b.  $[[The]_{det}[[red]_{adj}[[ball]_N]_{N'}]_{N'}]_{NP}$

(1a) reflects a “flat structure” hypothesis for the constituent structure of (1), while (1b) reflects a “nested structure” hypothesis. However, adult speakers assign structure (1b) to (1) based on the possibility of anaphoric substitutions like in (2):

2. I'll play with this red ball and you can play with that one.

In (2) [*red ball*] is the referent of *one*, and since anaphoric relations can only apply to constituents it must therefore be a node in the constituent structure of (1)—ruling out hypothesis (1a) in favor of (1b). Lidz et al. analyzed multiple corpora of adult speech to children for sentences that contained syntactically informative uses of *one*, like in (2). These made up only .02% of sentences containing anaphoric *one*. However in a looking-time study 18 mo children showed longer looking times when given instruction sentences with an anaphoric use of *one* (*Look! A yellow bottle...Now look. Do you see another one?*) and only one image contained an object that could be the referent (a yellow bottle). Based on this, they concluded that mastery of the anaphoric use of *one* does not come from applying a domain-general learning capacity to adult speech from the environment. Instead, it must result from a domain-specific system that goes online very early in development.

Although one may debate how the results like those of Lidz et al. should be interpreted, there is often agreement amongst both detractors and proponents of POS arguments as to what is at stake. For example, in their critique of such arguments Pullum and Scholz (2002, p.17) distinguish between two ways that “in principle” a child might learn a language:

The first, *innately primed* learning, calls upon inborn domain-specific linguistic information. . . The second, *data-driven learning*, does not; rather, it relies entirely on generalization from experience by the ordinary methods that are also used for learning other (nonlinguistic) things from experience.

Crucially, this way of characterizing the debate acknowledges that under both alternatives acquisition requires learning. Furthermore, [Pullum and Scholz \(2002, p.47\)](#) emphasize that there is no “absolute” difference between these approaches, and instead they endorse the view that researchers continue with a data-driven approach until innate priming better explains the data. A complementary characterization is offered by [Berwick et al. \(2011, p.1209\)](#), who distinguish between different factors that may be at play in language acquisition, including those that are innate and either domain-specific or domain-general. Although they doubt whether explanations that focus on domain-general factors will succeed in explaining the linguistic facts nonetheless they:

... share the desire to reduce any language-specific innate endowment, ideally to a logical minimum. The point of a POS argument is not to replace appeals to “learning” with appeals to “innate principles”... The goal is to identify phenomena that reveal [domain-specific] contributions to linguistic knowledge, in a way that helps characterize those contributions. One hopes for subsequent revision and reduction of the initial characterization... ([Berwick et al., 2011, p.1210](#))

Another illustrative example is provided by research on the so-called “fusiform face area” (FFA), a region in the more posterior portion of the human fusiform gyrus of the temporal lobe, which has been claimed to be specialized for visually representing faces ([Kanwisher et al., 1997](#); [McCarthy et al., 1997](#)). The classic evidence for this claim was that greater activity is found in this region for faces than other kinds of image stimuli (such as scenes). However, early studies also suggested that very similar portions of cortex showed greater activity in individuals that exhibited various kinds of visual expertise ([Gauthier et al., 2000](#); [Bilalić et al., 2011](#)). Based on these findings, it has been alternatively proposed that FFA is not specialized for representing faces, but any visual category with the appropriate sorts of visual features.

Crucially, as with the POS arguments, in the debate over the function of FFA it is largely agreed that our capacity to visually represent faces must depend on experience, and the difficult issue is the relative contributions of innate and learned capacities ([Kanwisher and Yovel, 2006](#)). Instead, what crucially divides the alternative explanations is whether FFA exhibits some form of domain-specific specialization for a particular visual category, faces, or only domain-general specialization for any similar visual category with which we have extensive visual experience.

So when properly understood, the nativism-empiricism debate is not about whether there are innate psychological capacities. Rather, it concerns the distribution of innately determined domain-general and domain-specific learning systems that make up the acquisition base for the development of these capacities, with empiricism and nativism offering different theoretical starting points as to the relative frequency of these learning systems. Or so I propose to assume in the discussion to follow. I now turn to what consequences

this characterization of the debate has for the minimal conception.

## 2.2 Why We Need the Minimal Conception

If the debate chiefly concerns the form of the acquisition base—or better, the best *starting point* in our theorizing about what form it might take—and not whether there are innate psychological capacities at all, then it is worth considering the implications this has for the supposed conceptual difficulties with the minimal conception. I have already mentioned that any conceptual burden, if present, is shared by the nativist and empiricist alike. Furthermore, since the notion of innateness is no longer taking center stage in framing the debate, the *need* for an analysis of innateness may also be attenuated. Still, there is a role to play for a notion of innateness. As long as we are clear on what the debate is really about, then [Margolis and Laurence \(2013, p.711\)](#) suggest:

... there is little harm in introducing a notion of innateness that is indexed to the point of contention between nativists and empiricists. Such a notion could be used to refer to the components of the Acquisition Base (i.e. components that figure in any proposed account of the Acquisition Base, whether nativist or empiricist).

The minimal conception is employed in just such a way: to indicate whether a psychological capacity is present in the acquisition base during development, or is instead acquired through learning. For according to the minimal conception, a psychological capacity is innate only if it is the result of non-learning processes in development. In fact, the minimal conception is crucial for characterizing the debate, because an important property of the capacities that make up the acquisition base is precisely that they are *not learned*.

To illustrate this last claim, consider again the examples of POS arguments and FFA. In both cases, support for nativist and empiricist hypotheses about language acquisition, or the form of stimulus selectivity in high-level visual cortex, comes from results showing that the psychological capacities (or their neural basis) are learned from experience, or form part of the acquisition base (or its implementation). So being innate, in the sense of not being learned (or learnable), picks out a crucial property of the acquisition base in both of these examples. The reason for this is that providing evidence that a capacity is, or is not, learned is central to determining whether it is explained by domain-general or specific learning mechanisms, and so whether a nativist or empiricist hypothesis is supported.

Of course, I am not claiming the minimal conception provides an *analysis*, in any robust sense, of innateness. For example, I have said nothing about what non-learning developmental processes might be like. Nor am I claiming that the minimal conception picks out the *only* interesting property of the acquisition base. Rather, my claim is that the minimal conception is indispensable for contrasting two ways psychological

capacities can emerge in development, as a result of learning or as part of the acquisition base, because this contrast is at the core of the nativism-empiricism debate (cf. [Gross and Rey, 2012](#), p.333). While modest, this is a perfectly coherent, and scientific, role for the minimal conception of innateness in cognitive science.

### 3 Problems with the Minimal Conception

Even if the minimal conception picks out a property that is important for characterizing the nativism-empiricism debate this does not insulate it from extant conceptual criticisms. Here I reply to four of them: (1) that the minimal conception risks overgeneralization; (2) lacks an account of learning; (3) frustrates genuine explanations of psychological development; and (4) fails to unify different notions of innateness across the life sciences.

#### 3.1 The Overgeneralization Problem

A general problem for any account of innateness is to avoid overgeneralizing; that is, counting certain capacities as innate when they are clearly not. For example, [Fodor \(1981\)](#) offers the example of a “Latin pill”, which when ingested, furnishes the consumer with a live competence of the dead language. While this competence is not the product of learning few would consider it innate. A less fanciful example is afforded by cases of acquired psychopathy caused by brain lesions from illness or accident ([Mameli and Bateson, 2011](#)). The problem appears to have special force for the minimal conception. For while being unlearned might provide a plausible necessary condition on innateness, it is not obviously sufficient ([Gross and Rey, 2012](#); [Samuels, 2007](#)). In which case, the minimal conception does not have the resources to exclude cases like the Latin pill or acquired psychopathy from being innate.

The extent to which the minimal conception offers necessary and sufficient conditions on innateness should be evaluated with respect to its theoretical role; namely, to help discriminate whether or not a psychological capacity is a feature of the acquisition base. Here it is useful to compare a proposal of [O’Neill \(2015\)](#). Many analyzes of innateness in the life sciences in one way or another appeal to the idea that a trait is innate when the emergence of that trait is insensitive to environmental variation.<sup>6</sup> O’Neill suggests that such insensitivity should be relativized to the sort of variation of interest to scientists. For example, [Griffiths and Machery \(2008, p.403-404\)](#) consider the case of birdsong in the brown-headed cowbird. Males develop a species-typical song even in the absence of exposure to other males singing. However, the song *is* influenced by responses of females of the species. [O’Neill \(2015, p.216\)](#) suggests we describe the male cowbird singing as innate with respect to exposure to male, but not female, conspecifics.

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<sup>6</sup>See for example: [Ariew \(1996\)](#); [Mallon and Weinberg \(2006\)](#); [Wimsatt \(1986\)](#).

I am doubtful whether relativizing innateness claims in the way suggested by O’Neill provides a plausible analysis of cases like that of the brown-headed cowbird. However, the useful implication of O’Neill’s proposal is that the scope of innateness claims are relative to, and constrained by, their *explanatory context*; that is, the different factors that may be contributing to the development of a trait, or in the present case, a psychological capacity. Within the contours of the nativism-empiricism debate, being the result of learning or part of the acquisition base exhausts the two alternatives factors of interest for determining how a psychological capacity developed. For this reason, the minimal conception also provides a sufficient condition on innateness. The argument goes as follows. First, by definition a capacity is present in the acquisition base iff it is innate. Second, as the minimal conception provides a necessary condition on innateness, if a capacity is part of the acquisition base, then it is the result of some non-learning process in development; or equivalently, if a capacity emerges in development due to learning, then it is not part of the acquisition base. Third, since the two factors of interest are exhaustive, if the capacity is not learned, then it is part of the acquisition base. So a capacity is part of the acquisition base iff it is not learned, and therefore, relative to the explanatory context of the debate, a psychological capacity is innate iff it is not learned.

Examples like Latin pills and acquired psychopathy are not problems for the minimal conception because they are not part of the acquisition base that is contrasted with learning when evaluating empiricist and nativist hypotheses. One may wonder what determines whether something qualifies as a relevant kind of non-learning process in development. This is a fair concern, but notice articulating what these processes might be like is the responsibility of nativists and empiricists themselves, not our conception of innateness that serves to help distinguish between their hypotheses.<sup>7</sup> Whatever its faults, the minimal conception is not at risk of overgeneralizing.

### 3.2 The Learning Problem

Clearly the minimal conception appeals to some notion of learning. But which one? There are of course many to choose from, which appears to pose a problem. For example, as pointed out by [Mameli and Bateson \(2006, p.166\)](#):

Learning is itself a theoretically controversial notion, variously regarded as hypothesis testing, conditioning (classical or operant), synaptic pruning or some other kind of selective process that operates on neural structures, any change in a brain network due to stimuli generated in the sensory apparatus by the interaction between the external environment and the sensory organ, etc. The relations between these views of learning are far from clear, and often display

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<sup>7</sup>Though I touch on some potential examples when discussing the next challenge for the minimal conception.

inconsistencies. For examples... many characteristics of neural structures count as not learned on the view that learning is hypothesis testing and count as learned on the view that learning is a change in neural structures due to perceptual processing. Which version of 'not learned' gets the status of scientific successor of the folk concept of innateness?

This objection assumes the minimal conception is tied to a particular account of learning. However, it at most requires *necessary* conditions on learning so that if a developmental process fails to satisfy one of the conditions, it is therefore not a learning process. Here are two such conditions. Some developmental process *P* qualifies as a form of learning only if:

*Input Condition (IC):* *P* receives environmentally caused inputs.

*Rule Condition (RC):* *P* is governed by, or conforms to, some rule for generalizing (or “abstracting”) from the information available in the environmentally caused inputs.

Consider each condition in turn. First, IC is just the plausible requirement that when we learn, we learn from experience; that is, environmental states of affairs are represented and hence serve as inputs to *P*. RC simply requires that *P* respect one of the many principles for how we can learn from experience such as: conditioning, association, explicit hypothesis testing, abduction, induction, or deduction.<sup>8</sup> Likewise, RC makes no presumption about the explanatory level at which learning is analyzed; synaptic rewiring that conforms to a Hebbian learning rule can also be included. Naturally there are then two different ways *P* can minimally fail to be a form of learning, by not satisfying either IC or RC (of course it might also fail to satisfy both conditions).

First, Consider a developmental process that does not satisfy RC. Many nativists have proposed that psychological capacities might be “triggered” in the sense that they are the product of informationally-impooverished input from the environment (Fodor, 1975; Khalidi, 2007). Crucially, if a capacity is triggered, it is not learned because by definition it is not the result of a process governed by a rule that involves generalizing from experience. For example, POS arguments posit triggering, since there is environmental input, which may play an important role in development, but the process that receives them cannot be a form of learning because the input is too informationally impoverished (Crain and Pietroski, 2001).<sup>9</sup>

Second, consider a developmental process that does not satisfy IC. Early in mammalian development several forms of plasticity occur, but some in response to endogenous rather than exogenous inputs. Because

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<sup>8</sup>In this list “conditioning” is meant to include evaluative conditioning in which a change in the preference for a conditioned stimulus is induced from being paired with a positive or negative unconditioned stimulus.

<sup>9</sup>One could argue that triggering involves a species of domain-specific learning that is specialized to operate in informationally-impooverished contexts. In which case, RC could be amended to refer only to domain-general learning rules. If triggering is not a clear case, then an alternative example of a process that violates RC would then be those that initiate the molecular cuing in visual development, described below.

this plasticity does not depend on exogenous input, it is not a form of learning and so any capacity that is produced as a result is plausibly innate (Scholl, 2005). For example, binocular vision in mammals depends heavily on a domain-specific acquisition base including sub-cortical structures like the lateral geniculate nucleus (LGN), which is the main thalamic relay point between the eyes and visual cortex. One of the key features of the LGN is that it consists of a layered structure that alternates in its connectivity between the left and right eye. Very early in development molecular cues cause a coarse delineation between these layers, which is then fine-tuned through plastic rewiring caused by spontaneous bursts of activity in the retina, known as “retinal waves” (Wong, 1999; Huberman et al., 2008). This burst-timing dependent plasticity in LGN, which involves correlated neural activity between the retina and LGN layers, has been shown to conform to a Hebbian learning rule (Butts et al., 2007). However, the process does not satisfy IC as the retinal inputs are endogenously caused, and so while it conforms to the right kind of rule, it is not a learning process. Here an interesting contrast is provided by the development of the visual system of the *Xenopus* tadpole (Demas et al., 2012). Spontaneous activity in their retina do not form wave patterns, and so visual development is instead entirely dominated by experiential inputs. Thus in an important sense the *Xenopus* tadpole, unlike humans and other mammals, may primarily acquires binocular vision through learning.

Of course, these are just two examples, but they illustrate the main point: the minimal conception only requires specification of necessary conditions on learning, and does not presume any particular form of learning. So it does not face a learning problem.

### 3.3 The Explanatory Problem

Even if one agrees with my responses so far one might think a more fundamental problem with the minimal conception remains: that it defines what is innate by what it is not (Cowie, 1999). The reason why such a negative conception is problematic, the argument goes, is that it blocks one kind of explanation of psychological development, in terms of learning, but offers no alternative in its place (Griffiths, 2002, p.73). One possible response is to concede, and suggest that the minimal conception might serve to stimulate positive research that attempts to show why a capacity is not innate (Weinberg and Mallon, 2008, 421-422). However, this tepid reply gives up too much, for two reasons.

First, as I have argued the role of the minimal conception is to draw out the contrast between different processes in development, and negatively defined notions can be perfectly adequate in such a role (Gross and Rey, 2012). So the negative form of the minimal conception is not a flaw but a feature. Second, this explanatory problem is not really about the inadequacies of the minimal conception per se, but rather about nativist hypotheses themselves. As stated by Margolis and Laurence (2013, p.705) the worry is that any

such hypothesis reflects:

a kind of theoretical laziness in that it merely postulates innate structure, or an excessively rich acquisition base, rather than taking up the challenging task of explaining where psychological traits come from.

But whether or not this is the case, the contrastive role of the minimal conception is one that applies for both nativist and empiricist hypotheses alike. Having recognized that the debate is really about the form of the acquisition base, and not whether there are innate capacities at all, the minimal conception is not burdened by the possible explanatory sins of nativism. Perhaps an argument can be made that nativists “should” say more about what non-learning processes are involved in the development of the domain-specific learning systems that feature in the acquisition base. But that is a challenge for the nativist, not the minimal conception.

### 3.4 The Unity Problem

The minimal conception is just one of many ideas associated with innateness across the life sciences. Others includes (cf. [Griffiths, 2002](#)): present at birth (or “inborn”); present early in development; subject to a critical period for acquisition; insensitive to changing external factors in development; the result of an evolutionary adaptation; a behavioral effect driven by genetic factors; and being shared by all members of a population, such as a species or culture. Following [Samuels \(2007\)](#) I will refer to these as the *I-properties*. The heart of the conceptual critique of innateness across the life sciences is that in practice these often empirically dissociable properties are somehow confounded. Absent some unifying analysis of innateness that is able to clarify the confusion, we should consider eliminating the notion from scientific practice ([Griffiths, 2002](#); [Mameli and Bateson, 2006](#); [Samuels, 2007](#)). In response to this challenge many philosophers have offered various theories of innateness in the life sciences—typically with mixed results ([Gross and Rey, 2012](#); [Linguist, 2018](#)).

Does the unity problem also present a challenge for the minimal conception? Scope provides one initial reason to answer in the negative. The minimal conception is just one of the I-properties associated with innateness in the life sciences, but with a particular role to play in characterizing the nativism-empiricism debate in cognitive science. Naturally, it makes little sense to think the minimal conception can unify the disparate I-properties given this modest role (cf. [Gross and Rey, 2012](#)). Instead, as an I-property the minimal conception is one of the desiderata that any analysis of innateness might try to take stock of when addressing the problem. However, there is a sense in which this negative answer misses the point. The problem is that the I-properties—although distinct and potentially even mutually exclusive from each other—are nonetheless

conflated in scientific discourse.<sup>10</sup> The minimal conception might be accounted for by any proposed solution, but as one of the conflated properties it is also a manifestation of the problem itself.

In reply I would suggest the unity problem is more apparent than real. As pointed out by [Samuels \(2007\)](#), it is one thing to claim that different scientific disciplines have different notions of innateness making the term *innate* potentially ambiguous. It is quite another matter entirely to claim that scientific usage *in fact* conflates these different senses, and the former claim does not immediately entail the latter. As I have argued, the role of the minimal conception is quite clear in cognitive science, even if the role of the other I-properties is not. But alternatively, the diverse notions may all capture different facets of innateness, in which case straining for conceptual unity (or purity) might generate the wrong result. Innateness may be a natural kind, but one that lacks necessary conditions or definitions ([Khalidi, 2016](#); [Samuels, 2007](#)), or it may instead reflect a plurality of natural kinds ([Mameli and Bateson, 2011](#)). Either alternative is more than compatible with the role of minimal conception in characterizing the nativism-empiricism debate. In summary, the minimal conception is not in the business of solving the unity problem, to the extent there is a clear problem to be solved in the first place.

## 4 The Minimal Conception and Primitivism

Primitivism holds that a psychological capacity is innate just in case it is not the result of a psychological process in development ([Cowie, 1999](#); [Samuels, 2002](#)). Crucially, primitivism does not entail there is *no* explanation of how the capacity emerges in development, but that such an explanation will not be psychological. The relationship between primitivism and the minimal conception is a close one. Indeed, in developing the case for primitivism, [Samuels \(2002, p.236\)](#) takes the minimal conception to be a “fundamental conceptual constraint” on *any* analysis of innateness in cognitive science, and offers the following contrast between the views:

A... proposal about nativism that bears a strong resemblance to primitivism is the familiar claim that something is innate just in case it not [*sic*] *learned*. Indeed, one might think that primitivism is merely a notational variant of this view. But clearly this depends on how we construe the notion of learning—an issue on which there is virtually no consensus. If by ‘learning’ we simply mean *any* psychological process by which psychological structures are acquired... then, on the primitivist account, being innate will be the same as being not learned. One view of primitivism, then, (and a view that I am happy to accept) is that it as [*sic*] an articulation of the appropriate sense in which innate cognitive structures are not learned. ([Samuels, 2002, p.250](#))

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<sup>10</sup>Again, as stated at the outset, my interest is not whether our folk notion of innateness is confused, as it may well be.

I agree with Samuels that primitivism is a variant, or at least descendent, of the minimal conception. However, I am doubtful that it provides an improved account of innateness, for two reasons. First, common objections to primitivism do not readily apply to the minimal conception. Second, primitivism risks obscuring what is at stake in the nativism-empiricism debate.

#### 4.1 Problems with Primitivism

Here are three objections to primitivism that do not apply to the minimal conception. First, a more technical problem with the formulation originally offered by Samuels (2002) is that it appeals to “correct” psychological theories. Specifically, some psychological capacity (or “structure”) is a psychological primitive just in case: (i) the capacity is posited by some correct psychological theory; and (ii) there is no correct psychological theory that explains how the capacity is acquired (Samuels, 2002, p.246). Put differently, to say the capacity is primitive is to say that: “*from the perspective of scientific psychology*, [the capacity] needs to be treated as one whose acquisition has no explanation” (Samuels, 2002, p.246), even though it may be explained by other branches of science. So more carefully, primitivism is the view that a psychological capacity is innate just in case it is primitive in this sense (Samuels, 2002, p.247).

As pointed out by Mallon and Weinberg (2006, p.334), this formulation of primitivism confuses the epistemology of psychological theory with the metaphysics of the processes by which psychological capacities are acquired. Innateness is a property of things in the world, not our explanations of them. In fairness, one can also provide a more “objective” gloss of primitivism that also avoids this problem (Mallon and Weinberg, 2006, p.335): a capacity is innate just in case it is not acquired by a psychological *process*—not because its acquisition cannot be explained by a psychological *theory*. Furthermore in other statements of primitivism Samuels (2004, 2007) seems to also adopt such a gloss. Still, unlike primitivism, the minimal conception is not at risk of confusing the metaphysics and epistemology of psychology.

Second, a major source of criticism of Samuels’ formulation of primitivism is in how it addresses the overdetermination problem discussed earlier. To address this challenge, Samuels (2002, p.259) adds the condition that a capacity is innate only if it would be acquired in the course of “normal” development. One objection to this added condition is that the division between normal and abnormal development is too vague to be useful (Mameli and Bateson, 2006). Along the same lines, even if the normalcy condition can address some of the cases Samuels considers (e.g. the Latin pill) other cases remain difficult to classify. For example, Khalidi (2007, p.97) offers the example of adolescent depression, which may have a non-psychological explanation (in terms of lower levels of serotonin), and is relatively common in teenage development. However, few would consider adolescent depression to be innate.

In anticipation of such criticisms, [Samuels \(2004, p.139-140\)](#) argues that appeals to normalcy conditions, as background constraints on the scope of scientific generalizations, are rife in virtually all branches of science. So articulating a sense of “normal development” is no more pressing for the primitivist than it is for understanding the hypotheses of working scientists. I am sympathetic to this reply. For example, consider that in research on Autism Spectrum Disorder (ASD) it is common to contrast the target population, of individuals diagnosed with ASD, with control participants who have experienced “neurotypical” development. In practice “neurotypical” usually means that neural development has been free of certain deviations during some critical period ([Meredith, 2015](#)).<sup>11</sup> If researchers working on ASD are allowed to appeal to a distinction between typical and atypical development, then presumably so too is the primitivist (though see [Gross and Rey, 2012, p.330](#)). However, at the same time, this rejoinder does not itself address potentially difficult cases like adolescent depression. And once more, the critique does not apply to the minimal conception, since my formulation relativizes to explanatory context. That being said, one interesting consideration is whether relativizing in this way could replace Samuels’ normalcy condition. Indeed, a case could be made that Samuels’ defense of the normalcy condition is arguably really a defense of the relevance of explanatory context to demarcating the boundary of scientific generalizations. Though of course, with such a revision, the difference from the minimal conception that primitivism promises would be made that much smaller.

Third, another frequent criticism of primitivism is that it relies on policing the boundaries between scientific disciplines and in particular the relationship between psychological and neuroscientific explanation ([Khalidi, 2007](#); [Linguist, 2018](#); [Mallon and Weinberg, 2006](#)). Of course, how serious one takes this challenge may ultimately depend on ones view of the relationship between these forms of explanation, and whether biological notions can also feature in psychological explanation. However, the minimal conception can be considered entirely agnostic on this issue. According to primitivism, if the “correct theory” of learning is that it is a neural process that requires a neuroscientific, as opposed to psychological, explanation, this would have the consequence that that the outcome of such learning is psychologically primitive, and therefore innate. However, the minimal conception does not share in this commitment, as illustrated by the earlier discussion of endogenously-caused neural plasticity in the development of binocular vision. In that case, the reason the process was not one of learning was because it did not satisfy IC—not because the explanation was neuroscientific. So the minimal conception assumes no sharp divide between psychological and neuroscientific explanation, which again speaks in its favor.

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<sup>11</sup>When recruiting “neurotypical” participants this usually involves screening for comorbidity with other psychiatric conditions, such as schizophrenia or psychopathy, and also conditions that impact learning such as dyslexia (which impacts reading ability) or dyscalculia (which impacts arithmetic skills).

## 4.2 Where Primitivism Goes Wrong

So there are objections that apply to primitivism that leave the minimal conception unscathed. At the same time, none of these objections speak to the primary motivation behind primitivism: to provide an account of innateness appropriate to cognitive science, which can ground the nativism-empiricism debate. But by this measure primitivism provides no improvement on the minimal conception.

As we have seen, one important “innate” property of psychological capacities that feature in the acquisition base is that they are not acquired by learning. More generally, we can say, if we like, that they are not acquired by a “psychological” process. As pointed out by [Margolis and Laurence \(2013, p.711\)](#), this is the “kernel of truth” behind primitivism. However, this kernel is simply a restatement of the minimal conception, as Samuels comes close to acknowledging in the quote from earlier. But then talking of “acquisition by a psychological process” simply obscures the fact that the contrast between capacities present in the acquisition base, and those acquired via learning, is that the former are *not learned*. No further analysis is even needed, if the role of our conception of innateness is simply to draw attention to the acquisition base—which it should be, when we have the right understanding of what is at stake in the nativism-empiricism debate.

So in short, the real problem with primitivism is two fold: (i) it is seemingly predicated on the wrong conception of the nativism-empiricism debate and offers an analysis of innateness where none may be needed; and (ii), its most plausible feature makes it *merely* a “notational variant” of the minimal conception. As Samuels acknowledges, the minimal conception is a fundamental constraint on how we think about innateness in cognitive science. We should accept the constraint as it is, without a primitivist repackaging.

## 5 The Minimal Conception and Natural Kinds

Let us return to the unity problem, which I argued presents no special challenge to the minimal conception. However, interestingly the minimal conception *does* pose a challenge for some attempts to address the problem by showing how the I-properties pick out a natural kind. In this penultimate section I critique two such attempts: first, that the I-properties manifest a stable form of clustering; and second, that they are joined by causal links between them.

### 5.1 Homeostatic Property Clusters

[Samuels \(2007\)](#) proposes that the I-properties may form a “homeostatic property cluster” (HPC) kind, which in Samuels’ telling meet three conditions (cf. [Boyd, 1991](#)): (i) they are associated with a number of co-instantiated properties none of which are strictly necessary for kind membership; (ii) that the co-

instantiation of these properties is explained by some underlying “causal mechanism”, and (iii) it is this causal mechanism, as opposed to the more traditional idea of some essence of set of necessary and sufficient conditions, which determines kind membership.<sup>12</sup> Samuels adopts a revised version of the HPC approach according to which what binds the I-properties are evidential relationships underwritten by the tenants of primitivism, such that instantiation of one of the I-properties tends to provide evidence that a capacity is psychologically primitive. For example, according to Samuels, capacities present at birth are unlikely to be the result of learning, and since learning is the paradigmatic example of a psychological acquisition process, their presence so early in development provides evidence that the capacities are psychologically primitive.

As I argued in the previous section, if there is a kernel of truth in primitivism, it simply reduces to the minimal conception. So Samuels proposal can be restated as the idea that the other I-properties tend to provide evidence that a capacity forms part of the acquisition base, and so is the result of a non-learning process in development—indeed for Samuels most of the evidential connections between the I-properties and primitivism are via an intermediary connection to the minimal conception. The problem for Samuels’ account is two fold. On the one hand, if the dependency relationship between the property cluster and the minimal conception is just an evidential one, then it would seem that the minimal conception is the true marker of what is innate. But the minimal conception does not obviously demarcate a natural kind, even in the HPC sense. For consider again that a developmental process might not qualify as a form of learning due to a failure to satisfy either the input or rule conditions. But such processes can be quite disparate, as we saw with triggering and endogenously-caused developmental plasticity in LGN. Alternatively, one might return to the idea of an underlying causal mechanism that explains why the I-properties cluster. However, it is far from clear that being the result of such a non-learning process is a causal mechanism that explains the co-occurrence of the other I-properties. In short, the minimal conception appears ill-suited to ground an HPC account of innateness as a natural kind.

## 5.2 Causal Links

A different approach to the natural kind status of innateness is provided by [Khalidi \(2016\)](#) who, unlike Samuels, identifies natural kinds with links between nodes in causal networks ([Khalidi, 2013](#)). For Khalidi, the base causal node is that of triggering (or triggerability), in the sense that a capacity can be acquired from a state of informational impoverishment. The instantiation of other I-properties then causally depend, in varying degrees, on triggering. For example, if a capacity can be triggered, then this would cause it not to be learned, since it does not involve processing information from the environment as evidence—or

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<sup>12</sup>There is substantial disagreement amongst proponents of HPC-stye approaches as to how the clustering and underlying mechanisms should be understood ([Boyd, 1999](#); [Millikan, 1999](#)). Here I set these issues aside and follow Samuels’ characterization.

as discussed earlier, it does not satisfy RC. Like Samuels, Khalidi also identifies a weak causal connection between non-learning and early onset, in so far as being able to acquire a capacity without learning entails there is no impediment to acquiring the capacity early in development—though similar to Samuels, Khalidi acknowledges a stronger evidential relationship in the opposite direction: that an early onset suggests an aspect of the acquisition base is not learned. Similarly, Khalidi identifies a weak causal link between triggering and invariance across a range of environmental variation, and in turn canalization and related I-properties.

The problem with Khalidi’s proposal is that, as I emphasized a moment ago, triggering is just one route by which a developmental process may not qualify as learning. Consider again the example of endogenously-caused developmental plasticity, which does not satisfy the input condition on learning. Therefore, any aspect of the acquisition base in visual development that depends on such plasticity qualifies as innate, given the minimal conception. But if there is more than one route to the minimal conception in the causal network, then the notion of innateness cannot be unified by the notion of triggering alone, as Khalidi suggests. As discussed within the context of the explanatory problem, a defining feature of the minimal conception is that it characterizes what is innate in negative terms. Thus, it likely subsumes many different kinds of non-learning processes, which again do not form any natural grouping. Indeed, they may even form a more natural grouping *with* learning processes, as is arguably the case with endogenously and exogenously caused developmental plasticity. Like with Samuels’ proposal, Khalidi’s causal network proposal leans heavily on the minimal conception in trying to characterize how different I-properties form a unified natural kind. However, it is doubtful that the minimal conception can bare the theoretical weight.

## 6 Conclusion

My goal has been to defend the minimal conception on multiple fronts: as crucial for characterizing the nativism-empiricism debate; as free from serious objections; and as superior to its descendent primitivism. What are the consequences of this defense? First, I think the upshot is that challenges to nativism on the basis of having a poorly characterized notion of innateness have been greatly overstated, and obscure the shared assumptions and conceptual foundations of both nativism and empiricism. Second, conceptual issues should not distract us from focusing on what the debate is really about: the empirical facts about the development of psychological capacities. On this topic there is already ample room for disagreement, and nativist and empiricist hypotheses, as hypotheses, may indeed be wrong. But there is nothing wrong with the minimal conception of innateness in cognitive science.<sup>13</sup>

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<sup>13</sup>Thank you to Evan Westra, the anonymous referees, and the Special Issue editors, Mateusz Hohol and Marcin Milkowski, for their helpful feedback on earlier versions of the manuscript. A special thanks is also due to Mark Engelbert. The ideas presented here grew from our many fruitful conversations about the notion of innateness. This project has received funding

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from the FWO and European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 665501, via an FWO [PEGASUS]<sup>2</sup> Marie Skłodowska-Curie fellowship (12T9217N) to the author.

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